

KINGSBOROUGH COMMUNITY COLLEGE
The City University of New York

CURRICULUM TRANSMITTAL COVER PAGE

Department: Math and Computer Science Date: 3/20/2018

Title Of Course Or Degree: Intermediate Algebra for STEM majors - MAT 9800

Change(s) Initiated: (Please check)


- | | |
|---|---|
| <input type="checkbox"/> Closing of Degree | <input type="checkbox"/> Change in Degree or Certificate Requirements |
| <input type="checkbox"/> Closing of Certificate | <input type="checkbox"/> Change in Degree Requirements (adding concentration) |
| <input type="checkbox"/> New Certificate Proposal | <input type="checkbox"/> Change in Pre/Co-Requisite |
| <input type="checkbox"/> New Degree Proposal | <input type="checkbox"/> Change in Course Designation |
| <input checked="" type="checkbox"/> New Course | <input type="checkbox"/> Change in Course Description |
| <input type="checkbox"/> New 82 Course | <input type="checkbox"/> Change in Course Title, Numbers Credit and/or Hour |
| <input type="checkbox"/> Deletion of Course | <input type="checkbox"/> Change in Academic Policy |
| | <input type="checkbox"/> Pathways Submission: |
| | <input type="checkbox"/> Life and Physical Science |
| | <input type="checkbox"/> Math and Quantitative Reasoning |
| | <input type="checkbox"/> A. World Cultures and Global Issues |
| | <input type="checkbox"/> B. U.S. Experience in its Diversity |
| | <input type="checkbox"/> C. Creative Expression |
| | <input type="checkbox"/> D. Individual and Society |
| | <input type="checkbox"/> 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: 3/20/2018 Signature, Committee Chairperson: 

I have reviewed the attached material/proposal

Signature, Department Chairperson: 

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 9800
Intermediate Algebra 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:

This course offers a comprehensive treatment of topics in algebra and trigonometry. These include the real numbers and their properties, evaluating algebraic expressions, integer and rational exponents, polynomial expressions, factoring techniques, rational expressions and mixed quotients, radical expressions, geometric formulas, solving linear and quadratic equations, complex numbers, linear inequalities, absolute value equations and inequalities, linear equations in two variables, the Distance and Midpoint Formulas, parallel and perpendicular lines, equations of circles, right triangle trigonometry and trigonometry of any angle, algebraic operations with trigonometric expressions, establishing trigonometric identities, the Sum of Angles/Difference of Angles/Double Angle/Half Angle formulas.

This course is intended **only** for students whose major requires Calculus I (MAT 1500). Students who have completed MAT 900 will **not** get credit for this course.

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

1-credit:	<input type="checkbox"/> 1 hour lecture
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	<input type="checkbox"/> 2 hours lab/field/gym
2-credits:	<input type="checkbox"/> 2 hours lecture <input type="checkbox"/> 1 hour lecture, 2 hours lab/field <input type="checkbox"/> 4 hours lab/field
3-credits:	<input type="checkbox"/> 3 hours lecture <input type="checkbox"/> 2 hours lecture, 2 hours lab/field <input type="checkbox"/> 1 hour lecture, 4 hours lab/field <input type="checkbox"/> 6 hours lab/field
4-credits:	<input type="checkbox"/> 4 hours lecture <input type="checkbox"/> 3 hours lecture, 2 hours lab/field <input type="checkbox"/> 2 hours lecture, 4 hours lab/field <input type="checkbox"/> 1 hour lecture, 6 hours lab/field <input type="checkbox"/> 8 hours lab/field
More than 4-credits:	<input type="checkbox"/> Number of credits: ____ (explain mix lecture/lab below) ____ Lecture ____ Lab
Explanation: <u>This is an intensive 8-equated-credit course.</u>	

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

6. NUMBER OF EQUATED CREDITS IN ITEM #5: 8
7. COURSE PREREQUISITES AND COREQUISITES (IF NONE PLEASE INDICATE FOR EACH)
- A. PREREQUISITE(S): Exit from mathematics remediation, per CUNY
- 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: Serves as prerequisite for those STEM majors who are required to take Precalculus.
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):

Algebra and Trigonometry (6th Edition) by Robert F. Blitzer, Pearson (2018)

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 precalculus and who have not otherwise satisfied the prerequisite to precalculus.

13. IF OPEN ONLY TO SELECTED STUDENTS SPECIFY POPULATION:

Open to students who have exited math remediation per CUNY.

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. Evaluate numerical expressions involving real numbers and algebraic expressions.
2. Solve linear, rational, quadratic, and absolute value equations in one variable. They will know how to apply the Factoring Method, the Square Root Property, Completing the Square, and the Quadratic Formula to solve quadratic equations.
3. Solve linear and absolute value inequalities, as well as understand and use set notation and interval notation. They will be able to graph the solution to such inequalities on a number line.
4. Perform operations on polynomial expressions. These include combining like-terms, multiplying and dividing polynomials (long and synthetic), factoring
5. Perform operations on rational expressions. These include simplifying, multiplying, dividing, adding, and subtracting. They will also be able to simplify mixed quotients using the least common multiple (LCM) .
6. Perform operations on radical expressions. These include evaluating radicals, simplifying, multiplying, dividing, and combining. They will also be able to rationalize the denominator/numerator for square roots.

7. Manipulate expressions involving rational (in particular, integer) exponents using various rules.
8. Perform computations with complex numbers, as well as solve quadratic equations with negative discriminant.
9. Apply the Pythagorean Theorem and other formulas that arise in geometry.
10. Graph the solutions of linear equations in two variables; find the slope of a line given two points; find an equation of a line given a point and the slope; find the intercepts of a line given its equation.
11. Determine if two lines are parallel or perpendicular from their equations; find an equation of a line containing a given point and parallel (or perpendicular) to a given line.
12. Use the Distance and Midpoint Formulas to determine the distance between two points and the midpoint of a line segment.
13. Graph circles in the Cartesian plane, find an equation of a circle given its center and radius, and vice-versa.
14. Solve a system of two linear equations in two variables.
15. Draw angles in standard position; convert from degrees to radians and vice-versa; use the Arc-Length Formula.
16. Find the exact values of the six trigonometric functions of any angle. In particular, they will be able to do right triangle trigonometry and apply the Fundamental Identities.
17. Do algebraic manipulations with trigonometric expressions. These include combining like-terms, multiplying, dividing, factoring, and simplifying mixed quotients.
18. Establish trigonometric identities using the Fundamental Identities and algebraic manipulations.
19. Use the Sum and Difference of Angles Formulas, the Double and Half-Angle Formulas, and the Product-to-Sum (Sum-to-Product) Formulas to do various calculations and establish more complicated identities.
20. Use the Law of Sines and Law of Cosines to solve a triangle, and find the area of a triangle using Heron's formula.

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 trigonometric concepts, operations, and procedures, combined with homework assignments designed to improve and solidify student understanding and mastery of these concepts, operations, and procedures.

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%

In order to pass this course, students must pass the comprehensive departmental final examination and have a passing overall average for the entire course.

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. Intermediate Algebra With Trigonometry by Charles P. McKeague, Academic Press (1983)
2. Algebra and Trigonometry: Structure and Method Book 2 by McDougal Littell, Houghton Mifflin (1994)
3. Amsco's Algebra 2 and Trigonometry by Xavier Gantert (2009)
4. Intermediate Algebra and Trigonometry by Robert F. Blitzer and Michael Sullivan, Pearson Custom Publishing (2005)
5. College Algebra and Trigonometry (3rd Edition) by J. S. Ratti and Marcus S. McWaters, Pearson (2015)
6. College Algebra and Trigonometry (6th Edition) by Michael Levitan, Bernard Kolman, and Arnold Shapiro, BVT Publishing (2011)
7. College Algebra and Trigonometry (7th Edition) by Richard N. Aufmann, Cengage Learning (2011)
8. Algebra and Trigonometry, Unit Circle (6th Edition) by Mervin Keedy, Marvin L. Bittinger, and Judith A. Beecher, Pearson (1993)

Topical Course Outline

- | <u>Day</u> | <u>Topic</u> |
|------------|--|
| 1 | a) The classification of numbers: the natural and whole numbers, the integers, the rational and irrational numbers
b) Arithmetic of real numbers; the order of operations |
| 2 | a) Properties of real numbers; the real number line and inequalities
b) Absolute value and distance on the number line; evaluating algebraic expressions; finding domains |
| 3 | a) Integer exponents and their properties
b) Negative exponents revisited: the Flipping Technique |
| 4 | a) Negative exponents revisited; scientific notation (converting to decimal number and vice-versa)
b) Operations with numbers in scientific notation (multiplication, division, and exponentiation) |
| 5 | a) Definitions and examples of polynomials
b) Addition and subtraction of monomials and polynomials |
| 6 | a) Multiplication of polynomials: multiplying monomial by monomial, monomial by polynomial, and binomial by binomial (the FOIL Method); special products of the form $(a + b)(a - b)$, $(a + b)^2$, and $(a - b)^2$
b) Multiplication of polynomials: multiplying binomial by polynomial with two or more terms, multiplying more than two binomials; simplifying problems involving multiplication |
| 7 | a) Long division of monomials and polynomials
b) Synthetic division |
| 8 | a) Factoring polynomials: the greatest common factor (GCF); difference of two squares
b) Factoring the sum and difference of two cubes; factoring completely with GCF's, squares, and cubes |
| 9 | a) Factoring quadratic trinomials of the form $x^2 + bx + c$ (using the Reverse Foil Method and the Grouping Method)
b) Factoring quadratic trinomials of the form $ax^2 + bx + c$ (using the Trial and Error Method and the Grouping Method) |
| 10 | a) Factoring completely with GCF's and quadratic trinomials
b) Other factoring problems: difference of two squares and two cubes such as $x^{(6)} - y^{(6)}$; trinomials of the form $x^{(2n)} + bx^{(n)} + c$ and |

$ax^2 + bxy + cy^2$; Grouping Method of polynomials with four terms
such as $x^2 + 8x + 16 - y^2$

- 11
 - a) Review for Exam 1
 - b) Exam 1
- 12
 - a) Rational expressions: definition, simplifying, multiplying
 - b) Rational expressions: multiplying, dividing
- 13
 - a) Rational expressions: adding and subtracting with common denominators and additive inverse denominators
 - b) Rational expressions: adding and subtracting with prime denominators; least common multiples (LCM) of polynomials
- 14
 - a) Rational expressions: adding and subtracting with factorable denominators using LCM's
 - b) Mixed quotients: simplifying by using the LCM or by dividing fractions
- 15
 - a) Square roots: definition; properties; simplifying a square root; multiplying and dividing square roots with monomial radicands
 - b) Square roots: adding and subtracting like-roots; multiplying square roots using the Distributive Property and FOIL Method; simplifying fractions containing an integral denominator and a square root in the numerator
- 16
 - a) Square roots: rationalizing denominators and numerators
 - b) Cube roots: definition; properties of cube roots; simplifying a cube root; multiplying and dividing cube roots with monomial radicands
- 17
 - a) Cube roots: adding and subtracting like-roots; multiplying cube roots using the Distributive Property and the FOIL Method
 - b) Radicals in general: definitions; properties of radicals; simplifying radicals; adding, subtracting, multiplying, and dividing radicals with equal indices
- 18
 - a) The Pythagorean Theorem; Pythagorean Triples
 - b) Geometry formulas; area, perimeter, circumference, volume, surface area
- 19
 - a) Rational exponents: definition, evaluating, converting rational exponent to radical and vice-versa
 - b) Rational exponents: using the properties of exponents to do algebra with radicals in their exponential form
- 20
 - a) Review for Exam 2
 - b) Exam 2
- 21
 - a) Solving linear equations in one variable
 - b) Solving literal equations for a specified variable
- 22
 - a) Quadratic equations: the Factoring Method, the Zero-Product and Square Root Properties

- b) Quadratic equations: Completing the Square Method
- 23
 - a) The Quadratic Formula, the discriminant of a quadratic equation; using the discriminant to determine the nature of the roots of a quadratic equation
 - b) Sum and product of roots; finding a quadratic equation or missing coefficient when given the roots
- 24
 - a) Complex Numbers: definition of the imaginary unit "i" and standard form "a + bi"; converting a square root of a negative number to standard form; simplifying, evaluating, and combining complex numbers; integral powers of "i"; multiplying two or more complex numbers with real part = 0
 - b) Complex Numbers: multiplying using the Distributive Property and the FOIL Method; putting $(a + bi)/(c + di)$ into standard form using conjugate
- 25
 - a) Complex Numbers: solving quadratic equations with complex roots
 - b) Set and interval notation; graphing sets on the real number line; Properties of Inequalities
- 26
 - a) Solving (one-sided) linear inequalities
 - b) Solving compound (two-sided) inequalities
- 27
 - a) Solving absolute value equations
 - b) Solving absolute value inequalities
- 28
 - a) The Cartesian plane; point plotting; the Distance and Midpoint Formulas
 - b) The Slope Formula; graphing a line given a point and slope
- 29
 - a) Linear equations in two variables: the Point-Slope, Slope-Intercept, and General Forms of the equation of a line; graphing a line whose equation is given in slope-intercept form
 - b) Linear equations in two variables: finding an equation of a line given two points; finding the slope and intercepts from the equation; graphing a line using both intercepts given its equation; vertical and horizontal lines
- 30
 - a) Parallel and perpendicular lines and their slopes; checking whether two lines are parallel or perpendicular; finding slopes and equations of lines parallel or perpendicular to a given line
 - b) Circles; Standard and General Forms of the equation of a circle; conversion between forms (with completing the square); finding the center and radius from both forms of the equation
- 31
 - a) Systems of two linear equations in two variables: finding the solution(s) by graphing; the Substitution Method
 - b) Systems of two linear equations in two variables: the Elimination Method
- 32
 - a) Review for Exam 3
 - b) Exam 3

- 33 a) Angles and degree measure; standard position of an angle; revolutions; minutes and seconds; Definition of a radian
b) Arc Length Formula; converting from degrees to radians and vice versa; area of a sector
- 34 a) Definition of the trigonometric functions of an acute angle; finding the trig. values of an angle with the sides given
b) Fundamental Identities: Reciprocal and Quotient; evaluating expressions using the identities
- 35 a) The Fundamental Identities: Pythagorean; evaluating expressions
b) Using the Fundamental Identities to determine the trig. values of an acute angle if one of the trig. values is given
- 36 a) Using a right triangle to determine 5 trig. values of an acute angle if one of the trig. values is given
b) Complementary Angle Theorem and cofunctions; the 45° - 45° - 90° and 30° - 60° - 90° right triangles
- 37 a) Using the calculator; solving right triangles and applications
b) Definition of the Trigonometric functions of any angle; finding the trig. values of an angle if a point on its terminal side is given
- 38 a) Sign table for the trig. functions by quadrants; reference angles
b) Finding the exact values of the trig. functions using reference angles the sign table
- 39 a) Coterminal angles; finding the exact trig. values of an angle measuring more than 360° ; negative angles (the Negative Angle Theorem); finding the exact trig. values of an angle measuring less than -360° using the Negative Angle Theorem
b) Quadrantal angles and their trig. values
- 40 a) Finding 5 trig. values of an angle if one of the trig. values and the quadrant of the terminal side of the angle is given; additional problems on finding exact values
b) Algebraic operations of trig. expressions: combining like terms, multiplication, division, factoring
- 41 a) Algebraic operations of trig. expressions: Adding, subtracting, multiplying, and dividing fractions with trig. expressions, simplifying mixed quotients with trig. expressions
b) Establishing trig. identities; the Fundamental Identities for trig. functions of any angle
- 42 a) Establishing trig. identities (continued)
b) Review for Exam 4

- 43
 - a) Exam 4
 - b) Sum of Angles Formulas

- 44
 - a) Difference of Angles Formulas
 - b) Double Angle Formulas

- 45
 - a) Double Angle Formulas (continued); Half Angle Formulas
 - b) Half Angle Formulas (continued)

- 46
 - a) Product-to-Sum and Sum-to-Product Formulas
 - b) The Law of Sines; the Law of Cosines

- 47
 - a) The Law of Cosines (continued); solving oblique triangles
 - b) Solving oblique triangles (continued); area of a triangle using $A = \frac{1}{2}ab\sin C$ and Heron's Formula

- 48 Review for Final Exam