**New York City College of Technology, CUNY**

**CURRICULUM MODIFICATION PROPOSAL FORM**

**This form is used for all curriculum modification proposals. See the** [**Proposal Classification Chart**](http://www.300jaystreet.com/college-council/resources/2010/04/2013-10-09-Proposal_Classification_Chart.docx) **for information about what types of modifications are major or minor. Completed proposals should be emailed to the Curriculum Committee chair.**

|  |  |
| --- | --- |
| **Title of Proposal** | **One year pilot of math courses with extended time and additional support** |
| **Date** | **3/3/17** |
| **Major or Minor** | **Minor** |
| **Proposer’s Name** | **Sandie Han** |
| **Department** | **Mathematics** |
| **Date of Departmental Meeting in which proposal was approved** | **3/2/17** |
| **Department Chair Name** | **Sandie Han** |
| **Department Chair Signature and Date** | **3/3/2017** |
| **Academic Dean Name** | **Justin Vazquez-Poritz** |
| **Academic Dean Signature and Date** | **3/3/17** |
| **Brief Description of Proposal**  **(Describe the modifications contained within this proposal in a succinct summary. More detailed content will be provided in the proposal body.** | As detailed below, to comply with a mandate from the CUNY Board of Trustees regarding movement from developmental to credit-bearing mathematics courses, the Math Department is adjusting its sequence, with full implementation scheduled for Fall 2018. In preparation, the Math Department will pilot new enhanced versions of Gateway courses Math 1275EN and Math 1190EN beginning in Summer 2017. The learning outcomes for the enhanced versions will be the same as the currently approved courses.  In order to conduct the pilot, an adjustment to the prerequisites is needed: (1) for the special pilot sections MAT 1275EN with two additional hours for the period summer 2017, fall 2017, spring 2018, and summer 2018; and (2) for pilot sections MAT1190EN also with two additional hours, for the period fall 2017, spring 2018, and summer 2018.  **MAT 1275EN--**The department proposes to offer two pilot sections of MAT 1275EN with extended time during summer and four pilot sections during fall and spring. The experimental sections will meet three times a week, instead of twice a week, utilizing the extended time for structured problem-solving.  Current prerequisite--MAT1175 or appropriate score on CUNY Placement Test  New prerequisite for pilot section of MAT 1275EN with 2 additional hours --passing grade in MAT 065, or ACCUPLACER score of 57 on the Elementary Algebra **and** between 20-59 on college-level math.  **MAT 1190EN**  Current prerequisite--CUNY proficiency in math and reading. New prerequisite for the pilot section of MAT 1190EN with 2 additional hours: ACCUPLACER Elementary Algebra score of 40-56 or passing grade in an arithmetic intervention. CUNY proficiency in reading. Non-STEM majors only.  The department proposes to offer two pilot sections of MAT 1190EN with extended time during fall, spring, and summer 2018. The experimental sections will meet two times a week with extended time, which will be used for structured problem-solving.  The target students for the pilot sections are the incoming freshman students. The registration of students into the pilot sections will be done by the New Student Center advisors. |
| **Brief Rationale for Proposal**  **(Provide a concise summary of why this proposed change is important to the department. More detailed content will be provided in the proposal body).** | Per a Board of Trustees resolution, CUNY Math Departments are required to offer some students who place in the upper level of developmental Math, the opportunity to take a credit-bearing math course with non-credit co-requisite support. Campus Math Departments have discretion re the placement criteria, structure of their sequences, and the format of the non-credit support offered. The City Tech Math Department, in consultation with the Math Discipline Council and CUNY Academic Affairs/ OIRA, has determined placement criteria and has been working on the instructional design for the non-credit co-requisites.  The department is preparing a proposal for the implementation of the new sequence to be submitted to college governance in Fall 2017. The purpose of the pilot sections is to collect and analyze data regarding learning outcomes for this new course model with support. This analysis will (1) inform final decisions regarding structure and placement criteria for the math sequence (2) determine the most effective content and format for the non-credit co-requisite.  **See Appendix:** Plan for Implementation of Revised Mathematics Sequences Submitted to CUNY OAA, February 6, 2017; updated, March 17, 2016 |
| **Proposal History**  **(Please provide history of this proposal: is this a resubmission? An updated version? This may most easily be expressed as a list).** | **This is a new submission as of 3/3/17.** |

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New York City College of Technology, CUNY

NEW COURSE PROPOSAL FORM

This form is used for all new course proposals. Attach this to the [Curriculum Modification Proposal Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-10-Curriculum_Modification_Proposal_Form.docx) and submit as one package as per instructions. Use one New Course Proposal Form for each new course.

|  |  |
| --- | --- |
| **Course Title** | College Algebra and Trigonometry |
| **Proposal Date** | March 3, 2017 |
| **Proposer’s Name** | Sandie Han |
| **Course Number** | MAT 1275EN |
| **Course Credits, Hours** | 4 credits, 6 hours |
| **Course Pre / Co-Requisites** | **Passing grade of MAT 065, or ACCUPLACER score of 57 on the Elementary Algebra and between 20-59 on college-level math.** |
| **Catalog Course Description** | An intermediate and advanced algebra course. Topics include quadratic equations, the distance and midpoint formula, graphing parabolas and circles, systems of linear and quadratic equations, an introduction to exponential and logarithmic functions. Topics from trigonometry including basic  trigonometric functions, identities, equations and solutions of triangles. |
| **Brief Rationale**  Provide a concise summary of why this course is important to the department, school or college. | To provide an accelerated track for students to enroll in college algebra and trigonometry after passing MAT 065 and to provide support for student success in the course.  The purpose of the pilot sections is to collect learning outcome data for this new course model. |
| **CUNY – Course Equivalencies**  Provide information about equivalent courses within CUNY, if any. | MAT 1275EN is equivalent to a number of similar courses at many different campuses across CUNY. This modified version MAT 1275EN with co-requisite support should have the same equivalencies as the standard MAT 1275. |
| **Intent to Submit as Common Core**  If this course is intended to fulfill one of the requirements in the common core, then indicate which area. | Yes – Mathematical and Quantitative Reasoning |
| **For Interdisciplinary Courses:**   * Date submitted to ID Committee for review * Date ID recommendation received   - Will all sections be offered as ID? Y/N | No |
|  |
|  |
| **Intent to Submit as a Writing Intensive Course** | No |

**NEW COURSE PROPOSAL CHECK LIST**

Use this checklist to ensure that all required documentation has been included. You may wish to use this checklist as a table of contents within the new course proposal.

|  |  |
| --- | --- |
| **Completed NEW COURSE PROPOSAL FORM** |  |
| * Title, Number, Credits, Hours, Catalog course description | x |
| * Brief Rationale | x |
| * CUNY – Course Equivalencies |  |
| Completed [Library Resources and Information Literacy Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/curriculum_modification_library_form.doc) |  |
| **Course Outline**  Include within the outline the following. |  |
| Hours and Credits for Lecture and Labs  If hours exceed mandated Carnegie Hours, then rationale for this | x |
| Prerequisites/Co- requisites | x |
| Detailed Course Description | x |
| Course Specific Learning Outcome and Assessment Tables   * Discipline Specific * General Education Specific Learning Outcome and Assessment Tables | x |
| Example Weekly Course outline | x |
| Grade Policy and Procedure | x |
| Recommended Instructional Materials (Textbooks, lab supplies, etc) | x |
| Library resources and bibliography |  |
| **Course Need Assessment.**  Describe the need for this course. Include in your statement the following information. |  |
| Target Students who will take this course. Which programs or departments, and how many anticipated?  Documentation of student views (if applicable, e.g. non-required elective). | x |
| Projected headcounts (fall/spring and day/evening) for each new or modified course. | x |
| If additional physical resources are required (new space, modifications, equipment), description of these requirements. If applicable, Memo or email from the VP for Finance and Administration with written comments regarding additional and/or new facilities, renovations or construction. | n/a |
| Where does this course overlap with other courses, both within and outside of the department? |  |
| Does the Department currently have full time faculty qualified to teach this course? If not, then what plans are there to cover this? | x |
| If needs assessment states that this course is required by an accrediting body, then provide documentation indicating that need. | n/a |
| **Course Design**  Describe how this course is designed. |  |
| Course Context (e.g. required, elective, capstone) | x |
| Course Structure: how the course will be offered (e.g. lecture, seminar, tutorial, fieldtrip)? | x |
| Anticipated pedagogical strategies and instructional design (e.g. Group Work, Case Study, Team Project, Lecture) | x |
| How does this course support Programmatic Learning Outcomes? | x |
| Is this course designed to be partially or fully online? If so, describe how this benefits students and/or program. | n/a |
| **Additional Forms for Specific Course Categories** |  |
| [Interdisciplinary Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/Application-for-Interdisciplinary-Course-Designation.docx) (if applicable) | n/a |
| Interdisciplinary Committee Recommendation (if applicable and if received)\*  \*Recommendation must be received before consideration by full Curriculum Committee | n/a |
| [Common Core (Liberal Arts) Intent to Submit](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/CommonCoreCourseSubmissionForm_4.2.12.doc) (if applicable) | n/a |
| Writing Intensive Form if course is intended to be a WIC (under development) | n/a |
| If course originated as an experimental course, then results of evaluation plan as developed with director of assessment. | n/a |
| **(Additional materials for** [**Curricular Experiments**](http://www.300jaystreet.com/college-council/curriculum_proposals/curricular-experiments)**)** |  |
| Plan and process for evaluation developed in consultation with the director of assessment. (Contact Director of Assessment for more information). |  |
| Established Timeline for Curricular Experiment | x |

**NEW YORK CITY COLLEGE OF TECHNOLOGY The City University of New York**

**DEPARTMENT:** Mathematics

**COURSE:** MAT 1275EN

**TITLE:** College Algebra and Trigonometry

**DESCRIPTION:** An intermediate and advanced

algebra course. Topics include quadratic equations, systems of linear equations, exponential and logarithmic functions; topics from trigonometry, including identities, equations and solutions of triangles.

**TEXT:** Custom Text by McGraw-Hill containing material from Intermediate Algebra, 3rd edition by

Julie Miller, Molly O'Neill, and Nancy Hyde and

Trigonometry, 2nd edition by John Coburn

**CREDITS:** 4 (6 hours class time)

**PREREQUISITES:** MAT 0650 OR for New Students, ACCUPLACER scores of at least 57 on the Elementary Aglebra and between 20-59 on college-level math

Prepared by:

K. Andrew Parker

Spring 2017

A. Testing/ Assessment Guidelines: The following exams should be scheduled:

1. A one-hour exam at the end of the First Quarter.
2. A one session exam at the end of the Second Quarter.
3. A one-hour exam at the end of the Third Quarter.
4. A one session Final Examination.

B. A scientific calculator is required.

**Course Intended Learning Outcomes/Assessment Methods**

|  |  |
| --- | --- |
| **Learning Outcomes** | **Assessment Methods** |
| **1.** Solve  Linear equations.  Rational equations.  One-variable quadratic equations by factoring, completing the square, and the quadratic formula.  Radical equations.  Exponential and logarithmic equations.  Systems of equations in 2 variables, both linear and non-linear.  Systems of equations in 3 variables. | Classroom activities and discussion,  homework, exams. |
| **2.** Perform operations with and simplify polynomial,  rational, radical, complex, exponential, and logarithmic expressions. | Classroom activities and discussion,  homework, exams. |
| **3.** Apply their knowledge of algebra and  trigonometry to solve verbal problems. | Classroom activities and discussion,  homework, exams. |
| **4.** Solve problems involving right and oblique triangles.  Prove trigonometric identities. Solve trigonometric equations. Graph the sine and cosine function. | Classroom activities and discussion,  homework, exams. |
| **5.** Apply the distance and midpoint formulas and  determine the graphs of circles and parabolas | Classroom activities and discussion,  homework, exams. |

**General Education Learning Outcomes/Assessment Methods**

|  |  |
| --- | --- |
| **Learning Outcomes** | **Assessment Methods** |
| **1.** Understand and employ both quantitative and  qualitative analysis to solve problems. | Classroom activities and discussion,  homework, exams. |
| **2.** Employ scientific reasoning and logical thinking. | Classroom activities and discussion,  homework, exams. |
| **3.** Communicate effectively using written and oral  means. | Classroom activities and discussion,  homework, exams. |
| **4.** Use creativity to solve problems. | Classroom activities and discussion,  homework, exams. |

**New York City College of Technology Policy on Academic Integrity**

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion. The complete text of the College policy on Academic Integrity may be found in the catalog.

**MAT 1275EN** College Algebra and Trigonometry

**Text:** McGraw-Hill Custom Textbook containing material from Intermediate Algebra**,** 3rd ed., by Miller, O'Neill and Hyde

(sessions 1-16 and 26-29) and Trigonometry, 2nd ed. by Coburn (sessions 18-25).

|  |  |
| --- | --- |
|  | **TOPICS** |
| **1** | **Lines Review**   * **Equations: Slope-Intercept and Point-Slope** * **Slope Formula and Intercepts** * **Parallel and Perpendicular through points** * **Graphing** |
| **2** | **2-D Systems of Equations**  **Substitution and Elimination** |
| **3** | **3-D Systems of Equations** |
| **4** | **GCF Factoring and Factoring by Grouping** |
| **5** | **Difference of Squares and AC-Method** |
| **6** | **Solving Quadratic Equations with the Zero-Product Property** |
| **7** | **Square Root Property and Completing the Square** |
| **8** | **The Quadratic Formula** |
| **9** | **The Imaginary Number, Complex Numbers** |
| **10** | **Graphs of Quadratic Functions**  **Vertex Formula and Standard Form** |
| **11** | **Distance Formula (Pythagorean Theorem)**  **Midpoint Formula**  **Circles (Complete the Square and Standard Form)** |
| **12** | **Non-Linear Systems** |
| **13** | **Adding and Subtracting Rational Expressions**  **Multiplying and Dividing Rational Expressions** |
| **14** | **Complex Fractions** |
| **15** | **Solving Fractional Equations** |
| **16** | **Exponent Properties**  **Negative Exponents (and Scientific Notation?)** |
| **17** | **Radicals (incl. nth roots)**  **Rational Exponents** |
| **18** | **Simplifying Radical Expressions**  **Addition and Subtraction of Radical Expressions** |
| **19** | **Multiplying and Dividing Radical Expressions** |
| **20** | **Operations on Complex Numbers and Rationalization** |
| **21** | **Solving Radical Equations** |
| **22** | **Angles in Degrees**  **Similar Triangles and Proportions** |
| **23** | **Special Triangles** |
| **24** | **Trigonometric Ratios of Right Triangles** |
| **25** | **Inverse Trigonometric Functions** |
| **26** | **Solving Right Triangles**  **Applications** |
| **27** | **Angles in Radians**  **Coordinate Plane Trigonometry** |
| **28** | **Unit Circle** |
| **29** | **Graphs of Sine and Cosine** |
| **30** | **Fundamental Identities**  **Proving Trig Tautologies** |
| **31** | **Solving Trigonometric Equations** |
| **32** | **Law of Sines** |
| **33** | **Law of Cosines** |
| **34** | **Exponential Functions** |
| **35** | **Logarithmic Functions** |
| **36** | **Properties of Logarithms** |
| **37** | **Exponential Equations**  **Applications to Compound Interest, Population Growth** |

**Need Assessment:**

MAT1175 no longer qualifies for TAP funding, so we must adapt our STEM-pipeline structure to both support students’ mathematical development and also prevent potential difficulties for students receiving financial aid.

Our experiment will move students directly from MAT0650 into MAT1275EN. It will also accept students who would otherwise have placed into MAT1175. Because these students are, in essence, skipping a prerequisite course - it is necessary to supplement their 1275EN experience. This supplement takes the form of two additional zero-credit classroom hours.

**Course Design:**

Because students are essentially skipping the prerequisite 1175 course, it is important that we review and/or cover several intermediary concepts as a bridge to competency on the standard 1275 learning outcomes. We have identified two major areas: lines and linear systems, and fundamentals of quadratics as topics that will necessitate a minimum of 4 additional lessons beyond the standard 1275 curriculum. Other topics in the existing 1275 curriculum were covered in both 1175 and 1275 – with the major difference being a deeper level of complexity in 1275. As a result, students participating in the experiment will be expected to learn many of these topics from scratch and still reach the level of complexity expected from the standard 1275 students. It is expected that these students will need to move through the material at a slower pace, again necessitating the addition of more lessons during the semester.

**Course Structure:**

Our plan is to structure the experimental course as one that meets 3 times per week, keeping each classroom meeting at the usual 100 minutes, but with an extra meeting each week. This extra meeting each week will be used to ‘stretch out’ the existing 1275 curriculum, while also accommodating the additional lessons required by cutting out 1175 from the sequence.

**Pedagogical Strategies and Instructional Design:**

Instructors participating in the experimental sections will be encouraged to attempt different active learning strategies – made possible by the expanded number of classroom hours.

The additional time will be necessary for identifying the major learning gaps students bring with them, along with interventional instruction in the identified topics. Specific techniques for this additional instruction will vary between instructors and likely even between topics. Participating 1275EN instructors have been trained in a variety of active learning strategies, and it is expected that the additional instruction will make use of some of the following:

* Real-world applications
* Inquiry-based learning
* Guided discovery
* Interactive classroom technology

**Plan and Process for Evaluation:**

Experimental sections of 1275EN will take the same final exam as the current 1275 sections. By using a scoring guide to aid in a standardized evaluation process, we will collect item-level data on final exams in both 1275EN and 1275 in order to assess student learning outcomes. Item level data will also aid in identifying specific topics where 1275EN instructors will want to focus extra attention in order to ensure that 1275EN students are as ready to progress as their 1275 peers.

Beyond overall pass rates and final exam data, we will also be tracking student performance in the subsequent 1375 course. We want to be sure that, more than simply passing the course, students are prepared for success in their next math class. To that extent, we will be comparing the 1375 pass rates of successful 1275EN students to the pass rates of successful 1275 students.

We plan to pilot between 2 to 4 sections each semester. If the enrollment is approximately 30 students per section, we anticipate between 240 to 360 students will participate in the pilot sections over the academic year 2017-18, including summers 2017 and 2018. We are planning to recruit from incoming freshmen who are placed into MAT 1175 and students who have successfully completed MAT 0650.

New York City College of Technology, CUNY

NEW COURSE PROPOSAL FORM

This form is used for all new course proposals. Attach this to the [Curriculum Modification Proposal Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/2013-10-10-Curriculum_Modification_Proposal_Form.docx) and submit as one package as per instructions. Use one New Course Proposal Form for each new course.

|  |  |
| --- | --- |
| **Course Title** | Quantitative Reasoning |
| **Proposal Date** | March 3, 2017 |
| **Proposer’s Name** | Sandie Han |
| **Course Number** | MAT 1190EN |
| **Course Credits, Hours** | 3 credits, 5 hours |
| **Course Pre / Co-Requisites** | **ACCUPLACER Elementary Algebra score of 40-56 or passing grade in the arithmetic intervention. CUNY proficiency in reading. Non-STEM majors only.** |
| **Catalog Course Description** | Students develop and apply mathematical, logical, critical thinking, and statistical skills to solve problems in real-world contexts. They acquire skills in the fields of algebra, geometry, probability, statistics, and mathematical modeling. The course incorporates opportunities within the classroom to develop students’ reading, writing, oral, and listening skills in a mathematical context. |
| **Brief Rationale**  Provide a concise summary of why this course is important to the department, school or college. | To provide an alternative to elementary algebra track for non-STEM majors.  The purpose of the pilot sections is to collect learning outcome data for this new course model. |
| **CUNY – Course Equivalencies**  Provide information about equivalent courses within CUNY, if any. |  |
| **Intent to Submit as Common Core**  If this course is intended to fulfill one of the requirements in the common core, then indicate which area. | Yes |
| **For Interdisciplinary Courses:**   * Date submitted to ID Committee for review * Date ID recommendation received   - Will all sections be offered as ID? Y/N | No |
|  |
|  |
| **Intent to Submit as a Writing Intensive Course** | No |

**NEW COURSE PROPOSAL CHECK LIST**

Use this checklist to ensure that all required documentation has been included. You may wish to use this checklist as a table of contents within the new course proposal.

|  |  |
| --- | --- |
| **Completed NEW COURSE PROPOSAL FORM** |  |
| * Title, Number, Credits, Hours, Catalog course description | x |
| * Brief Rationale | x |
| * CUNY – Course Equivalencies |  |
| Completed [Library Resources and Information Literacy Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/curriculum_modification_library_form.doc) |  |
| **Course Outline**  Include within the outline the following. |  |
| Hours and Credits for Lecture and Labs  If hours exceed mandated Carnegie Hours, then rationale for this | x |
| Prerequisites/Co- requisites | x |
| Detailed Course Description | x |
| Course Specific Learning Outcome and Assessment Tables   * Discipline Specific * General Education Specific Learning Outcome and Assessment Tables | x |
| Example Weekly Course outline | x |
| Grade Policy and Procedure | x |
| Recommended Instructional Materials (Textbooks, lab supplies, etc) | x |
| Library resources and bibliography |  |
| **Course Need Assessment.**  Describe the need for this course. Include in your statement the following information. |  |
| Target Students who will take this course. Which programs or departments, and how many anticipated?  Documentation of student views (if applicable, e.g. non-required elective). | x |
| Projected headcounts (fall/spring and day/evening) for each new or modified course. | x |
| If additional physical resources are required (new space, modifications, equipment), description of these requirements. If applicable, Memo or email from the VP for Finance and Administration with written comments regarding additional and/or new facilities, renovations or construction. | n/a |
| Where does this course overlap with other courses, both within and outside of the department? | x |
| Does the Department currently have full time faculty qualified to teach this course? If not, then what plans are there to cover this? | x |
| If needs assessment states that this course is required by an accrediting body, then provide documentation indicating that need. | n/a |
| **Course Design**  Describe how this course is designed. |  |
| Course Context (e.g. required, elective, capstone) | x |
| Course Structure: how the course will be offered (e.g. lecture, seminar, tutorial, fieldtrip)? | x |
| Anticipated pedagogical strategies and instructional design (e.g. Group Work, Case Study, Team Project, Lecture) | x |
| How does this course support Programmatic Learning Outcomes? | x |
| Is this course designed to be partially or fully online? If so, describe how this benefits students and/or program. | n/a |
| **Additional Forms for Specific Course Categories** |  |
| [Interdisciplinary Form](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/Application-for-Interdisciplinary-Course-Designation.docx) (if applicable) | n/a |
| Interdisciplinary Committee Recommendation (if applicable and if received)\*  \*Recommendation must be received before consideration by full Curriculum Committee | n/a |
| [Common Core (Liberal Arts) Intent to Submit](http://openlab.citytech.cuny.edu/collegecouncil/files/2014/08/CommonCoreCourseSubmissionForm_4.2.12.doc) (if applicable) | n/a |
| Writing Intensive Form if course is intended to be a WIC (under development) | n/a |
| If course originated as an experimental course, then results of evaluation plan as developed with director of assessment. | n/a |
| **(Additional materials for** [**Curricular Experiments**](http://www.300jaystreet.com/college-council/curriculum_proposals/curricular-experiments)**)** |  |
| Plan and process for evaluation developed in consultation with the director of assessment. (Contact Director of Assessment for more information). |  |
| Established Timeline for Curricular Experiment | x |

**New York City College of Technology**

**Mathematics Department**

## COURSE: MAT 1190EN

## TITLE: Quantitative Reasoning

**PREPARED BY: Professors Nadia Benakli, Ariane Masuda, Estela Rojas, and Arnavaz Taraporevala**

## Number of class hours, lab hours if applicable, credits: 5 hours, 3 cr.

**COURSE DESCRIPTION:**

Students develop and apply mathematical, logical, critical thinking, and statistical skills to solve problems in real-world contexts. They acquire skills in the fields of algebra, geometry, probability, statistics, and mathematical modeling. The course incorporates opportunities within the classroom to develop students’ reading, writing, oral, and listening skills in a mathematical context. The extended hours will be used for students to apply problem solving strategies, reinforcing the concepts of MAT 1190, as well as basic mathematics skills.

**COURSE CO/PREREQUISITE (S):**

**Prerequisite:**

* **Certified in reading and**
* Passing grade in Arithmetic course, or ACCUPLACER: 40-56
* Non-STEM majors only

**REQUIRED TEXTBOOK and/or MATERIALS**

**Title: Quantway I and II (Tentatively)**

**Publisher: Carnegie Math Pathways**

**Rationale:** Quantway I and II textbooks fulfill the purpose of this course by offering students the possibility of an “accelerated alternative mathematics pathway that successfully enables students to complete their developmental math requirements” and quantitative reasoning course for non-STEM students in one semester.

**A scientific calculator is required.**

### COURSE INTENDED LEARNING OUTCOMES/ASSESSMENT METHODS

|  |  |
| --- | --- |
| LEARNING OUTCOMES | ASSESSMENT METHODS |
| **1.** Apply mathematical, logical, critical thinking, and statistical skills to solve problems in real-world contexts. | **1.** Group activities, written report. |
| **2.** Represent mathematical information symbolically, visually, numerically, and verbally. | **2.** Individual oral presentations, in-class group activities. |
| **3.** Estimate mathematical quantities as well as evaluate the accuracy of estimates, and adjust estimates when necessary. | **3.** Classroom discussion, in-class estimation group assignments. |
| **4.** Represent and know how to read, collect and organize data in an assortment of appropriate written and graphical forms. | **4.** Classroom discussion, in-class group assignments (e.g., students read a newspaper article on a current issue, collect and analyze data related to the issue in the article, and write a report.), learning logs. |
| **5.** Recognize and understand functions as a way of modeling correspondence between two variables (linear and exponential). | **5.** Individual short essay related to functions (e.g., population growth, economics, climate change). |
| **6** Describe the behavior of common functions in words, graphically, algebraically and in tables. | **6.** Written report and group presentation (e.g., an analysis of the garbage patch in the Pacific Ocean),learning logs. |

### GENERAL EDUCATION LEARNING OUTCOMES/ASSESSMENT METHODS

|  |  |
| --- | --- |
| LEARNING OUTCOMES | ASSESSMENT METHODS |
| **1.** Demonstrate the ability to work collaboratively and independently on assignments in and outside a classroom setting. | **1.** Classroom discussions, group assignments and individual oral presentations. |
| **2.** Understand and employ both quantitative and qualitative analysis to solve problems**.** | **2.** Classroom Discussion, Group Activities, Group Presentations, Quizzes, Tests, Final Exam. |
| **3.** Develop reading, writing competencies, and listening skills. | **3.** Biweekly reading and writing assignments, individual and group presentation, classroom discussion. Each homework assignment requires written responses. |
| **4.** Work with teams. Build consensus. Use creativity. | **4.** Group Projects and Presentations. |

**Assessment\* of the course should include the following:**

* **At least three tests 35%**
* **Work from the extended hour 35%**
* **Final exam 30%**

**In addition to this list, the instructor could incorporate homework and/or quizzes.**

**ACADEMIC INTEGRITY POLICY STATEMENT**

**Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion. The complete text of the College policy on Academic Integrity may be found in the catalog.**

**Topics to be covered:** linear equations; applications of linear equations; ratio, proportion and direct var.; linear inequalities; systems of linear equations; mathematical reasoning; estimation and graphs; statements/quantifiers; truth tables; length and unit conversions; area, volume and capacity; weight and temperature; percents; simple interest; compound interest; basic probability; tree diagrams, tables; gather/organize data; picture data; measures of average; measures of variation; measures of position; normal distribution; applications of the normal distribution; correlation and regression; points, lines, planes and angles; triangles; polygons and perimeter; areas of polygons and circles.

**\*depending on department policy these may be uniform and required of all instructors of the course or there may be guidelines or samples from which instructors may select or adapt**

**Every session, based on the topics described below, will have an hour of problem solving and group assignment activities. Student work will be collected at the end of the session.**

|  |  |
| --- | --- |
| Session | Topics |
| 1 | Linear equations |
|  | Applications of linear equations |
| 2 | Ratio, proportion & direct var. |
| 3 | Linear inequalities |
| 4 | Systems of linear equations |
| 5 | Mathematical reasoning |
| 6 | Estimation & graphs |
| 7 | Exam I |
| 8 | Statements/quantifiers |
| 9 | Truth tables |
| 10 | Length & unit conversions |
| 11 | Area, volume & capacity |
| 12 | Weight & temperature |
| 13 | Percents |
| 14 | Exam II |
| 15 | Simple interest |
| 16 | Compound interest |
| 17 | Basic probability |
| 18 | Tree diagrams, tables |
| 19 | Gather/organize data |
|  | Picture data |
| 20 | Measures of average |
| 21 | Exam III |
| 22 | Measures of variation |
| 23 | Measures of position |
| 24 | Normal distribution |
|  | Applications of the normal distribution |
| 25 | Correlation and regression |
| 26 | Points, lines, planes & angles |
| 27 | Triangles |
| 28 | Polygons and perimeter |
|  | Areas of polygons and circles |
| 29 | Review |
| 30 | Final exam |

**Need Assessment:**

The experimental section will allow students, after meeting arithmetic standard, to take credit level course MAT 1190EN quantitative reasoning without taking elementary algebra and CEAFE. This proposal responds to EVC Rabinowitz’ memo to develop an alternative to elementary algebra mathematics track. Because these students are, in essence, skipping a prerequisite course - it is necessary to supplement their MAT1190EN experience. This supplement takes the form of two additional zero-credit classroom hours.

**Course Design:**

MAT 1190EN focus mainly on real world problem-solving in topics, such as tax, finance, probability and statistics, and simple mathematical models. Because these students have met only the minimum arithmetic standard, it is important that we provide additional support to strengthen their problem-solving strategies and skills. The additional two hours of class time will be used for group work, modules, or hands-on work. It is expected that these students will need to move through the material at a slower pace, more practice, again necessitating the addition of class time.

**Course Structure:**

The class will meet twice a week, 2½ each class. The last hour of the class is devoted to hands-on work, group work, or problem-solving.

**Pedagogical Strategies and Instructional Design:**

Instructors participating in the experimental sections will be encouraged to attempt different active learning strategies – made possible by the expanded number of classroom hours.

**Plan and Process for Evaluation:**

Experimental sections will take the same final exam as the current 1190 sections. By using a scoring guide to aid in a standardized evaluation process, we will collect item-level data on the final exam for comparison to current 1190 final exam outcomes. Overall passing rates will also be compared.

We plan to pilot 2 sections each semester. If the enrollment is approximately 30 students per section, we anticipate approximately 180 students will participate in the pilot sections over the academic year 2017-18, including summer 2018. We are planning to recruit from non-STEM majors who have met the ACCUPLACER arithmetic standard (a score of 40-56 on the elementary algebra test).

Besides the learning outcome assessment, we will examine passing rates in the pilot sections of MAT 1190EN and compare them with the regular MAT 1190 sections. For students who continue on to take MAT 1272 statistics, we will track their performance in MAT 1272.

APPENDIX

New York City College of Technology

Plan for Implementation of Revised Mathematics Sequences

Submitted to CUNY OAA, February 6, 2017; updated, March 17, 2016

**Coordinators**

Bonne August, Provost and Vice President for Academic Affairs

Pamela Brown, Associate Provost

Sandie Han, Professor and Chair, Department of Mathematics

Justin Vazquez-Poritz, Dean, School of Arts & Sciences

**Background and Rationale**

The majority of City Tech’s degree programs are concentrated in technology, science, and health, with the remainder in other career-focused areas like hospitality management, business, and communication design. All of the college’s baccalaureate programs lead either to BS or BTech degrees; the college does not offer a BA. Except for an AA in Liberal Arts, the associate degree programs are mainly AAS degrees, with some AS degrees. For this reason, a large percentage of students need algebra, and many require calculus. During the transition to Pathways, the Math Department developed a three-credit Quantitative Reasoning course that meets the math requirement for most non-STEM majors, and therefore since Fall 2013 the college has had both a STEM and a Pathways-approved non-STEM credit-bearing track in mathematics. In Fall 2016, 6525 students took math classes ranging from developmental math through Calculus I. Of these, a total of 3667 students (56.2%) were in the STEM track, with 2858 (43.8%) in the non-STEM track.

**Current Sequences**

Currently, regardless of major, all students identified as having a need for developmental math, place into the same non-credit sequence before proceeding to one of the credit-bearing math courses:

**Current Developmental Math**

Math 0630 (7 hrs., 0 credits) Elementary Algebra with Basic Mathematics Review

Math 0650 (5 hrs, 0 credits) Elementary Algebra

Developmental Math persistently accounts for the largest number of students in the FYE Summer Immersion Program (CUE).

**Current Non-STEM Math Sequence**

Non-STEM students take MAT 1190, Quantitative Reasoning (3 hrs., 3 credits). Faculty in the Math Dept., assisted by CUNY QR Fellows, have continued to develop the curriculum and teaching materials for this course, which has been well-received. MAT 1190 is a pre-requisite for MAT 1272, Statistics (3hrs., 3 credits), which several non-STEM programs require.

**Current STEM Math Sequence**

Students in STEM-focused program, as determined either by initial placement or successful completion of the developmental sequence, begin at a point in the following sequence:

MAT 1175 Fundamentals of Mathematics (4 hrs., 4 credits)

MAT 1275 College Algebra and trigonometry (4 hrs, 4 credits)

MAT 1375 Pre-Calculus (4 hrs., 4 credits)

Mat 1475 Calculus (4 hrs., 4 credits)

MAT 1575 Calculus II (4 hrs., 4 credits)

**Pass Rates and Retention**

The overall success of these high enrollment math courses has been a continuing source of concern. For Fall 2015, for example, of 699 students who completed MAT 063, the lower developmental course, the pass rate was 27.3%. It should be further noted that the completion rate for the course was only 53.9%. The table below indicates the number of students who completed the course, with the number in parentheses indicating the percentage that number represents of those originally enrolled. For the credit courses, the overall pass rate is shown, as well as the percentage who earned A, B, or C and the percentage who received a D.

|  |  |  |
| --- | --- | --- |
| **Course** | **Completers\*** | **Pass rate** |
| 063 | 699 (53.9%) | 27.3% |
| 065 | 1137 (62.6%) | 48.6% |
| 1175 | 834 (81.4%) | 59.2 (C)+17.4 (D)=76.6% |
| 1275 | 1454 (81.8%) | 58.1% (C )+17.2 (D)=75.3% |
| 1375 | 1156 (84.1%) | 63.9 (C )+16.8 (D)= 80.7% |
| 1475 | 906 (84.9) | 56.7 (C );+18.9 (D)=75.6% |

There is tremendous variability among instructors regarding both retention and pass rates. We don’t have data regarding the performance broken down for students whose initial placement put them into MAT 1175 as compared to those who first completed the developmental sequence or for first-time course-takers versus repeaters. However, we do know that a D or even a C grade does not bode well for performance in the subsequent course.

By contrast, the overall completion rate for MAT 1190, the non-STEM track, was 86.5% in Fall 2015, with a pass rate of 90.6 % (78% C or higher).

**Supports for Math students**

To accelerate students’ progress, the college and the Math Department have piloted many strategies, using grant and CUNY funding. These include pre-testing and pre-course workshops, classroom-based support, learning communities, self-regulated learning (SRL), electronic tools, and traditional tutoring, and many others. Some have proven effective in pilots but are not scalable. Others offer more promise for larger-scale implementation, including

* Peer Led Team Learning (PLTL)
* MSEIP pre-course workshops and self-paced materials
* Title V Opening Gateways for online instructional and support materials for MAT 1275
* ASAP support for application of math in the majors

It sometimes seems as if no amount of additional resources to support students in math would be enough to meet the demand. In order to achieve better coordination among these efforts and also to inform students more effectively about the various forms of academic support, a Math Support group was formed in Spring 2016 including: SEEK, ASAP, Student Accessibility Center, Learning Center, BMI, and other who provide assistance in math, either to targeted groups or generally. The goal is two-fold: to assess, implement, and share best practices and to coordinate and disseminate information to students, faculty, and staff so that anyone in need of support has ready access to proven, high-quality assistance.

In addition to students’ needs with mathematics itself, they are very challenged when they must apply mathematics in technology and engineering technology classes. For many students, despite their having demonstrated competence in math courses, mathematics is not a tool in the way it needs to be in these fields.

**Proposed Sequences**

To accelerate students’ progress and increase student success, the college proposes reconfiguring both the developmental and the credit mathematics sequences, in compliance with University guidelines as follows:

|  |  |  |
| --- | --- | --- |
| **Placement** | **Exemption—Per CUNY policy, students will be considered proficient if they score:**   * New York State Regents-Algebra 1 or Geometry—70; or Algebra 2--65 * SAT--530 * ACT--   **Testing--All students are tested for placement--**Expanded test information/ preparation is in development.   * **Exempt**—Accuplacer College Math for placement into credit-bearing courses beyond the entry level; see below for placement information. * **Non-exempt**--Accuplacer Elementary Algebra   40 🡪 placement into co-requisite MAT 1190 (Non-STEM) or MAT 0650(STEM)  57 🡪 placement into credit-bearing math via Accuplacer College Math  **Retest** after 10 business days offered to students close to passing Elementary Algebra (50-56) are offered an opportunity to retest  **Provide advisement re appropriate path to the following groups:**  1. Intended STEM majors with scores less than 57 in Elementary Algebra  2. Non-STEM majors who score well in Algebra  3. Undecided students with MAT 1275 level scores or higher | |
| **PROPOSED PATHS** | **Non-STEM Path--Quantitative Reasoning/ Statistics** | **STEM Path (Algebra/Calculus)** Depending upon program requirements |
| **Developmental/ Basic Math** | Not proficient in arithmetic—CUNY Math START, summer Immersion, BEOC (Other alternatives may be developed)  **Exit:** Course performance includingdepartmental or other common exam. | Not proficient in arithmetic—CUNY Math START, Summer Immersion, BEOC, or other intervention TBD/ **Advisement required**  Not proficient in algebra—MATH 0650 (5 hrs/ 0 credits)/ **Advisement required**  **Exit:** Course performance+ CEAFE (35%) |
| **Credit Math** (All courses will meet Pathways QR requirement) | \***Math 1190EN** Quantitative Reasoning (MAT 1190 curriculum with required non-credit support)  **OR**  **MAT 1190** Quantitative Reasoning  **MAT 1272** Statistics (if program requires)  \*Bridge to Calculus—for students who initially select a non-STEM path and later decide to transfer to a STEM program | **\*MAT 1275EN** College Algebra and Trigonometry (4 hrs., 4 credits + non-credit co-req.)  *CUNY Proficient in Elementary Algebra + less than 60 on ACCUPLACER College-Level Math and less than 80 on Algebra I Regents*  **OR**  **MAT 1275** College Algebra and trigonometry (4 hrs, 4 credits)  *CUNY Proficient in Elementary Algebra +* ***either*** *60-79 on ACCUPLACER College-Level Math* ***or*** *80-100 on Algebra I Regents*  **MAT 1375** Pre-Calculus (4 hrs, 4 credits)  *CUNY Proficient in Elementary Algebra + either 80-94 on ACCUPLACER College-level Math OR 80-100 on Algebra 2 Regents.*  **Mat 1475** Calculus (4 hrs. 4 credits)  *CUNY Proficient in Elementary Algebra + 95 or higher on ACCUPLACER College Level Math*  **MAT 1575** Calculus II (4 hrs, 4 credits) |

\*Under development

**Co-requisite Support**

In consultation with the Math Department, we have determined that the most expedition way to implement co-requisite support for the two existing courses that will now be gateway courses, MAT 1190 (Non-STEM) and MAT 1275 (STEM), will be to develop lab components taught by the same teachers. It does not seem feasible to develop curriculum, hire and train facilitators, and develop a scheduling plan in the short term. For some of the same reasons, we are not attempting a cohort model, except perhaps for first semester students as part of our Learning Communities.

Furthermore, existing resources have been dedicated to preparing and supporting students in both of these courses. MAT 1190 is a recently developed course for which considerable attention has been given by the Math faculty, assisted by QR Fellows. A cohort of committed instructors of 1190 already exists, and we believe it will be possible to run pilot in Fall 2017, Spring 2018, and Summer 2018 and to offer MAT 1190 with co-requisite support at scale in Fall 2018. It was conceived as a hands-on course and should lend itself well to an augmented version.

Two current federal grants, an MSEIP and a Title V (Opening Gateways) are directed toward instructional materials and strategies for strengthening students’ performance in MAT 1275. We envision a small pilot in the summer of 2017, a larger pilot in Fall 2017, Spring 2017, and Summer 2018, with full implementation in Fall 2018. At the same time, the course coordinators will facilitate the development of a core of engaged faculty who will continue to refine the course.

**Other Stakeholders**

During the pilot phase several implementation teams, designated below, will convene to identify and address implementation needs, prepare informational and advisement materials, and

**Faculty in other disciplines**—Built Environment (Architecture, Construction Management and Civil Engineering Technology, Environmental Control and Facilities Management); Business (Accounting, Marketing, Hospitality Management, Health Services Administration); Computer Systems and Engineering Technology; Science (Biomedical Informatics, Chemistry, Physics), Social Science (Psychology, Sociology, Economics); Health.

**College Systems and Services**

Marcela Armoza, VP for Enrollment and Student Affairs

Tasha Rhodes, Registrar

Julia Jordan, Director of Faculty Commons

Karen Lundstrem, Director of Instructional Technology

Tammie Cumming, Director of AIR

**Campus Advisers**

Angela Kavanagh, Director New Student Center

Paul Dorestant, Director SEEK

Yelena Bondar, Director ASAP

Lauri Aguirre, Director CUE/Immersion

Lourdes Smith, Director Transfer Center

**Academic Support providers**

Math Dept. faculty (Profs. Reitz, Singh, Poirier, Han, Benakli, Kostadinov)

SEEK—Ron Platzer

ASAP—Yelena Bondar

Student Accessibility Center—John Reed Currie

College Learning Center—Judy Rockway

**Timeline**

October 2016-February 2017 Determine proposed components of new sequences

November 2016- Identify needs for Advisement, test prep, academic support

January 2017 Determine depts. to review Math requirements—BUS, NUR

January 2017 Designate participating Stakeholders

January 2017 Analyze distribution of students across sequences

February 2017 Consult with CUNY Math START

February-March 2017 Design co-requisite support

February –March 2017 Prepare information/ guidance materials for incoming first-year and transfer students; train advisers

Spring 2017 Departmental and Governance approval for pilot courses

Spring 2017 Design Assessment plan—outcome, targets

Spring 2017 Math Department designates course coordinators, who plan professional development for instructors

Summer 2017 Pilot +EN option for MAT 1275; analyze data

Summer 2017 Initiate Math START

Fall 2017 Pilot MAT 1190EN; expanded pilot of MAT 1275S[[1]](#footnote-1)

Fall 2017 Implement full test prep and advisement activities

Early Spring 2018 Submit proposal for full implementation

Fall 2018 Full implementation of MAT1275EN

**Assessment**

Dr. Tammie Cumming, Director of the Office of Assessment and Institutional Research, will work with the Math Department in Spring 2017 to design an assessment plan for the two new augmented courses, including:

* Success in meeting learning outcomes
* Overall completion and pass rates
* Performance in subsequent math courses
* Performance in courses requiring math applications

Building on the existing Gen Ed Assessment plan, we will also assess performance across the board in the mathematics sequence. A team from the Math Department will analyze the data and propose and implement strategies for improvement.

In Fall 2018, all participants will convene to review progress and propose possible alternative modalities for the components of the sequence. The Math Department faculty and all of us hope to use this opportunity to address in fresh and informed ways problems that have plagued our math offerings for many years. The gap between the math skills demanded by our high tech programs and the level of preparation of large numbers of students who aspire to these programs has been an often insurmountable obstacle to improving retention and success. With the mandate from CUNY, the ability to bring to bear extensive data, and the talent and commitment of the math faculty and those providing academic support, we hope to offer our students significantly improved odds for success.

1. Given the high fail rate in MAT 1175, we will need to continue to offer it at least through Fall 2018 for the students who need to repeat F or D grades. We hope to be able to include some of the supports developed for MAT 1275EN. [↑](#footnote-ref-1)