

CURRICULUM TRANSMITTAL COVER PAGE

Department: Math and Computer Science

Date: 01/14/2019

Title Of Course/Degree/Concentration/Certificate: Calculus I (MAT 1500)

Change(s) Initiated: (Please check)

- | | |
|-------------------------------------------------------|------------------------------------------------------------------------------------------|
| <input type="checkbox"/> Closing of Degree | <input type="checkbox"/> Change in Degree or Certificate |
| <input type="checkbox"/> Closing of Certificate | <input type="checkbox"/> Change in Degree: Adding Concentration |
| <input type="checkbox"/> New Certificate Proposal | <input type="checkbox"/> Change in Degree: Deleting Concentration |
| <input type="checkbox"/> New Degree Proposal | <input type="checkbox"/> Change in Prerequisite, Corequisite, and/or Pre/Co-requisite |
| <input type="checkbox"/> New Course | <input type="checkbox"/> Change in Course Designation |
| <input type="checkbox"/> New 82 Course (Pilot Course) | <input type="checkbox"/> Change in Course Description |
| <input type="checkbox"/> Deletion of Course(s) | <input checked="" type="checkbox"/> Change in Course Title, Number, Credits and/or Hours |
| | <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 |
- Change in Program Learning Outcomes
- 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: _____ Signature, Committee Chairperson: _____

If submitted Curriculum Action affects another Department, signature of the affected Department(s) is required:

Date Approved: 1/16/19 Signature, Department Chairperson: [Signature] *I am aware of this submission*

Date Approved: _____ Signature, Department Chairperson: _____

I have reviewed the attached material/proposal

Signature, Department Chairperson: R Young 1/14/2019



TO: Spring 2019 Curriculum Committee
FROM: Department of Mathematics & Computer Science
DATE: 01/14/2019
RE: Change in Number of Course Credits for Calculus I (MAT 1500)

The Department of Mathematics & Computer Science is proposing a change in number of Course Credits for Calculus I (MAT 1500).

FROM:

4 credits, 4 hrs.

TO:

3 credits, 4 hrs. (2 lecture hrs., 2 hr. lab)

Rationale for Change: The change in number of credits reflects curricular adjustments to allow for 2 lab hours and 2 lecture hours, as reflected in the course syllabus.

Kingsborough Community College
The City University of New York

Modifications in Credits/Hours for an Existing Course Form

1. Course Number and Title:
Mathematics and Computer Science
Math 1500 – Calculus I

2. This Course is **currently** listed as:

4 Credits 4 Hours (include break-down of lecture, lab, or gym)
4 Lecture Hours

3. **Proposed** Change in Credits/Hours (Please check **ONE** appropriate box below based on credits):

It is recommended that you refer to the “College Credits Assigned for Instructional Hours” PDF at
<http://kingsborough.edu/aa/Pages/forms.aspx>

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

1-credit:	<input type="checkbox"/> 1 hour lecture
	<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 checked="" 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:	_____

4. Rationale/Justification for the change in credits/hours for this course:
The change in number of credits reflects curricular adjustments to allow for 2 lab hours and 2 lecture hours, as reflected in the course syllabus.

5. Include the **Current** Syllabus/Topical Course Outline and the **Proposed** Syllabus/Topical Course Outline for the course. **Highlight** areas that have been modified and serve as the justification for the proposed change in credits/hours for the course.
See attachments.

Department of Mathematics and Computer Science

1. **Department, Course Number and Title**
Department of Mathematics & Computer Science, MAT 15, Calculus I.
2. **Distribution Requirements for Groups I-V**
This course does satisfy the Group V requirement.
3. **Demonstration of Course Transferability**
Course MAT 15 (Calculus I) is equivalent to:

City College – MATH 10100 (Calculus 1), 4credits;

Baruch College – MTH 2010 (Elementary Calculus 1), 4credits;

Hunter College – MATH 150 (Calculus with Analytic Geometry 1), 4 credits;

Lehman College – MAT 175 (Calculus 1), 4 credits;

Brooklyn College – MATH 3.3 (Calculus 1), 3credits;

Queens College – MATH 151 (Calculus/ Differentiation and Integration), 4 credits;

College of Staten Island – MTH 231 (Analytic Geometry and Calculus 1), 3 credits;

New City Technical College –MA 475 (Analytic Geometry and Calculus 1) 4 credits;

York College –MATH 121 (Analytic Geometry and Calculus 1) 4 credits;

John Jay College of Criminal Justice – MAH 241 (Calculus 1), 3credits.
4. **Bulletin Description of Course**
An introduction to the calculus of algebraic functions of one variable.
Limits and continuity; derivatives and slopes of graphs; analysis of motion and rates of change; rules of differentiation; higher derivatives; related rates, asymptotes; applications to graphing; maximum-minimum problems, approximation methods, antiderivatives; the definite integral; the Fundamental Theorem of Calculus; derivatives of trigonometric functions. Calculus I is preparation for the major's courses in Mathematics, Computer Science, Physics, and several other sciences.
5. **Number of Weekly Class Hours**
Four hours per week.
6. **Number of Credits**
Four credits.

7. Prerequisites

- A. Prerequisite: MAT 14.
- B. Pre or Co-requisite: MAT 10.

8. Justification for Course and Expected Enrollment

Calculus is a foundation of modern mathematics and it is widely used in physics and physical sciences, modern biology, a wide variety of technical sciences, computer science, economics, and modern medicine. Knowledge of calculus is demanded by many modern sciences and technologies today. Therefore, this course is required for many majors, both at Kingsborough and at other colleges.

Calculus 1 is the first part of a three-semester sequence of courses designed to enable students to obtain a basic knowledge of this high-level subject. As this Department's initial professional-level course in calculus, it plays an important role in the Department's curricula in Mathematics and in Computer Science.

Mathematics 15 is also an integral offering of the Department to help to fulfill Kingsborough's mission of specialized and general education, career development, and preparation for transfer to a four year college. Calculus 1 helps to give students the mathematical background needed to take a number of courses in other departments, especially in different fields of sciences and technology. It also helps students develop logical and analytic skills and improve their reasoning skills.

Calculus 1 is offered for the Fall and Spring semesters as well as during the Winter and Summer modules. Average enrollment for Calculus 1 is approximately one hundred students per semester for the Fall and Spring semesters, and approximately fifty students for the Winter and Summer modules.

9. Course Withdrawals

None.

10. CPI Requirements

Yes, in Mathematics.

11. Field Work, Internship, or Independent Study

N/A

12. Proposed Text Book

Calculus Alternate Shrink Wrap Plus Study Guide 6th, D.C. Heath, 0395889022 .

13. Required Course for Majors

Mathematics, Computer Science, Physics, Engineering science, Chemistry, Pharmacy Transfer.

14. Specify If Course Is Open Only to Selected Students

N/A

15. What Students Will Know and Be Able To Do Upon Completion of Course

Upon completion of the course students will have the basic knowledge of limits and continuity, and differentiating and integrating functions. They will be able to do the following:

- a) Evaluate the limits of algebraic functions using different techniques.
- b) Test functions for continuity.
- c) Differentiate functions using definition of derivatives and rules of differentiation.
- d) Differentiate composite functions and functions defined implicitly.
- e) Find higher derivatives.
- f) Investigate functions and sketch their graphs using differentiation.
- g) Solve simple geometric, physical and optimization problems using differentiation.
- h) Use differentials for approximation of values of functions.
- i) Evaluate indefinite and definite integrals of some algebraic functions.
- j) Find areas of some figures using integration.

16. Method of Teaching

Lectures.

17. Assignments to Students

Daily exercises and review.

18. Method of Evaluating Learning:

Class examinations and final examination.

19. Topical Course Outline:

Lesson	Topic	Section
1-2	Functions; combinations of functions	1.5
3-4	Limits: informal introduction	2.1
5	Finding limits; one-sided limits	2.2
6-7	Continuity; the Intermediate Value Theorem	2.3
8	Infinite limits; vertical asymptotes	3.4
9-10	Derivatives, slopes, tangent lines	3.1
11	Examination	
12-13	Velocity, acceleration, rates of change	3.2
14	Differentiation: powers, constant multiples, sums and differences	3.3
15	Product and quotient rules	3.4
16	Chain rule; general power rule	3.5
17	Implicit differentiation	3.6
18-19	Related rates	3.7
20	Maxima and minima of a function on an interval	4.1
21	The Mean Value Theorem	4.2
22	Examination	
23-24	Increasing and decreasing functions; the first derivative test	4.3
25	Concavity; the second derivative test	4.4
26	Limits at infinity; horizontal asymptotes	4.5
27-28	Curve sketching	4.6

29-30	Maximum-minimum problems	4.7
31	Newton's Method	4.8
32	Differentials and approximation	4.9
33	Examination	
34	Review: trigonometric functions	8.1
35	Graphs and limits of trigonometric functions	8.2
36-37	Derivatives of trigonometric functions and applications	8.3
38	Antiderivatives, including polynomials and powers	5.1
39	Area under a graph, as a limit of approximating sums	5.2
40	The definite integral	5.3
41	The Fundamental Theorem of Calculus	5.4
42	Integration by substitution	5.5
43	(Optional) Numeric integration techniques	5.6
44	Examination	
45-48	Semester review	

20. Selected Bibliography

1. James Stewart, *Calculus, Fourth Edition*, Brooks/Cole Publishing Company.
2. Larson & Edwards, *Brief Calculus, An Applied Approach, Fifth Edition*, Houghton Mifflin Company.

Course syllabus: Mathematics 15

Updated by Aleksandr Davydov, October, 2003

Department of Mathematics & Computer Science
KINGSBOROUGH COMMUNITY COLLEGE
THE CITY UNIVERSITY OF NEW YORK

Proposed

COURSE SYLLABUS: MAT 1500

1. **DEPARTMENT, COURSE NUMBER, AND TITLE (SPEAK TO ACADEMIC SCHEDULING FOR NEW COURSE NUMBER ASSIGNMENT):**
Department of Mathematics and Computer Science
MAT 1500 - Calculus I

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:**

Course MAT 1500 (Calculus 1) is equivalent to:

Brooklyn College MATH 1201 (Calculus 1), 4 credits;

College of Staten Island MTH 230 (Analytic Geometry and Calculus 1), 3 credits;

City College of New York MATH 20100 (Calculus I), 3 credits.

John Jay College of Criminal Justice MAH 241 (Calculus 1), 3 credits.

4. **BULLETIN DESCRIPTION OF COURSE:**

An introduction to the calculus of algebraic functions of one variable. Limits and continuity; derivatives and slopes of graphs; analysis of motion and rates of change; rules of differentiation; higher derivatives; related rates, asymptotes; applications to graphing; maximum-minimum problems, approximation methods, antiderivatives; the definite integral; the Fundamental Theorem of Calculus; derivatives of trigonometric functions. Calculus 1 is preparation for the major courses in Mathematics, Computer Science, Physics, and several other sciences.

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

1-credit:	<input type="checkbox"/> 1 hour lecture
	<input type="checkbox"/> 2 hours lab/field/gym

2-credits:	<input type="checkbox"/> 2 hours lecture
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	<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, 1 hour lab/recitation <input checked="" 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: _____	

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

6. **NUMBER OF EQUATED CREDITS IN ITEM #5:** N/A

7. **COURSE PREREQUISITES AND COREQUISITES (IF NONE PLEASE INDICATE FOR EACH)**

A. **PREREQUISITE(S):** MAT 1400 with grade of "C" or better

B. **COREQUISITE(S):** MAT 1000

C. **PRE/COREQUISITE(S):** MAT 1000

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):** N/A

B. **PROJECTED ENROLLMENT:** Approximately 100-125 students in each of fall and spring semesters; approximately 50 students in each of winter and summer modules

C. **SUGGESTED CLASS LIMITS:** 30 students

D. **FREQUENCY COURSE IS LIKELY TO BE OFFERED:** Fall, Spring, Summer, and Winter

E. **ROLE OF COURSE IN DEPARTMENT'S CURRICULUM AND COLLEGE'S MISSION**

Calculus is a foundation of modern mathematics and it is widely used in physics and physical sciences, modern biology, a wide variety of technical sciences, computer science, economics, and modern medicine. Knowledge of calculus is demanded by many modern sciences and technologies today. Therefore, this course is required for many majors, both at Kingsborough and at other colleges.

Calculus 1 is the first part of a three-semester sequence of courses designed to enable students to obtain a basic knowledge of this high-level subject. As this Department's initial professional-level course in calculus, it plays an important role in the Department's curricula in Mathematics and in Computer Science.

Mathematics 1500 is also an integral offering of the Department to help to fulfill Kingsborough's

mission of specialized and general education, career development, and preparation for transfer to a four year college. Calculus 1 helps to give students the mathematical background needed to take a number of courses in other departments, especially in different fields of sciences and technology. It also helps students develop logical and analytic skills and improve their reasoning skills.

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):
Calculus Alternate 6th Ed, Larson, Hostetler, Edwards, ISBN: 0395889022.

12. REQUIRED COURSE FOR MAJOR OR AREA OF CONCENTRATION?

Required for Mathematics, Computer Science, Physics, Engineering science, Chemistry, Pharmacy Transfer

13. IF OPEN ONLY TO SELECTED STUDENTS SPECIFY POPULATION: N/A

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

Upon completion of the course students will have the basic knowledge of limits and continuity, and differentiating and integrating functions. They will be able to do the following:

Evaluate the limits of algebraic functions using different techniques.

1. Test functions for continuity.
2. Differentiate functions using definition of derivatives and rules of differentiation.
3. Differentiate composite functions and functions defined implicitly.
4. Find higher derivatives.
5. Investigate functions and sketch their graphs using differentiation.
6. Solve simple geometric, physical and optimization problems using differentiation.
7. Use differentials for approximation of values of functions.
8. Evaluate indefinite and definite integrals of some algebraic functions.
9. Find areas of some figures using integration.

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.:
Classroom lectures and labs. In the labs students will practice performing relevant skills

described in question #14.

16. ASSIGNMENTS TO STUDENTS: Daily exercises and review.

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. Class examinations and final examination. Suggested guideline: Class exams: 50%; Final exam: 30%; Assignments: 20%.

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

Lesson	Topic	Section
1	Functions; combinations of functions	1.5
2-3	Limits: informal introduction	2.1
Lab	Work on function and limits problems	
4	Finding limits; one-sided limits	2.2
5-6	Continuity; the Intermediate Value Theorem	2.3
Lab	Practice finding limits and continuity	
Lab 7	Infinite limits; vertical asymptotes	3.4
8-9	Derivatives, slopes, tangent lines	3.1
	Examination I	
10-11	Velocity, acceleration, rates of change	3.2
12	Differentiation: powers, constant multiples, sums and differences	3.3
Lab	Work on rates of change and differentiation	
13	Product and quotient rules	3.4
14-15	Chain rule; general power rule	3.5
	Implicit differentiation	3.6
Lab	Work on chain rule and Implicit differentiation	
16	Related rates	3.7
17	Maxima and minima of a function on an interval	4.1
Lab 18	The Mean Value Theorem	4.2
	Examination II	
Lab 19-20	Increasing and decreasing functions; the first derivative test	4.3
21	Concavity; the second derivative test	4.4
Lab	Work on the first and second derivative tests	
22	Limits at infinity; horizontal asymptotes	4.5
23-24	Curve sketching	4.6
Lab	Work on Curve sketching	
25	Maximum-minimum problems	4.7
26	Newton's Method	4.8
Lab 27	Differentials and approximation	4.9
	Examination III	
28	Review: trigonometric functions	8.1
	Graphs and limits of trigonometric functions	8.2
Lab 29-30	Derivatives of trigonometric functions and applications	8.3

Lab	Work on derivatives of trigonometric functions	
31	Antiderivatives, including polynomials and powers	5.1
Lab 32	Area under a graph, as a limit of approximating sums	5.2
33	The definite integral	5.3
Lab	Work on antiderivatives and definite integral	
34	The Fundamental Theorem of Calculus	5.4
35	Integration by substitution	5.5
	Examination IV	
Lab 36	Semester review	

19. SELECTED BIBLIOGRAPHY AND SOURCE MATERIALS:

Stewart, James, *Calculus, Fourth Edition*, Brooks/Cole Publishing Company.

Larson & Edwards, *Brief Calculus, An Applied Approach, Fifth Edition*, Houghton Mifflin Company.

Stewart, James, *Calculus, 8th Edition*, Cengage Learning, 2015.

Spivak, Michael, *Calculus, 4th edition*, Publish or Perish, 2008.

James Stewart, *Single Variable Calculus: Early Transcendentals 8th Edition*, Cengage Learning, 2015.

Anton, Howard, *Calculus, Binder Ready Version 11th Edition*, Wiley, 2016.

Hass, Joel, Heil, Christopher, and Weir, Maurice, *Thomas' Calculus 14th Edition*, Pearson 2017.

Larson, Ron, and Edwards, , *Calculus*, Cengage Learning 2017.

Updated by Max Tran, 01/2019