KINGSBOROUGH COMMUNITY COLLEGE
The City University of New York

CURRICULUM TRANSMITTAL COVER PAGE

Department: Math and Computer Science **Date:** 01/14/2019

Title Of Course/Degree/Concentration/Certificate: Calculus II (MAT 1600)

Change(s) Initiated: (Please check)

- ☐ Closing of Degree
- ☐ Closing of Certificate
- ☐ New Certificate Proposal
- ☐ New Degree Proposal
- ☐ New Course
- ☐ New 82 Course (Pilot Course)
- ☐ Deletion of Course(s)
- ☐ Change in Degree or Certificate
- ☐ Change in Degree: Adding Concentration
- ☐ Change in Degree: Deleting Concentration
- ☐ Change in Prerequisite, Corequisite, and/or Pre/Co-requisite
- ☐ Change in Course Designation
- ☐ Change in Course Description
- ■ Change in Course Title, Number, Credits and/or Hours
- ☐ Change in Academic Policy
- ☐ Pathways Submission:
  - ☐ Life and Physical Science
  - ☐ Math and Quantitative Reasoning
  - ☐ A. World Cultures and Global Issues
  - ☐ B. U.S. Experience in its Diversity
  - ☐ C. Creative Expression
  - ☐ D. Individual and Society
  - ☐ E. Scientific World
- ☐ 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 Yau 1/14/2019

Revised/Augl.2018/AK

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
   MAT 1600 - Calculus II

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:	☐ 1 hour lecture ☐ 2 hours lab/field/gym
2-credits:	☐ 2 hours lecture ☐ 1 hour lecture, 2 hours lab/field ☐ 4 hours lab/field
3-credits:	☐ 3 hours lecture ☒ 2 hours lecture, 2 hours lab/field ☐ 1 hour lecture, 4 hours lab/field ☐ 6 hours lab/field
4-credits:	☐ 4 hours lecture ☐ 3 hours lecture, 2 hours lab/field ☐ 2 hours lecture, 4 hours lab/field ☐ 1 hour lecture, 6 hours lab/field ☐ 8 hours lab/field
More than 4-credits:	☐ Number of credits: ____ (explain mix lecture/lab below) ___ Lecture ____Lab Explanation:_____

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.

KINGSBOROUGH
COMMUNITY COLLEGE
DREAMS BEGIN HERE

TO: Spring 2019 Curriculum Committee

FROM: Department of Mathematics & Computer Science

DATE: 01/14/2019

RE: Change in Number of Course Credits for Calculus II (MAT 1600)

The Department of Mathematics & Computer Science is proposing a change in number of Course Credits for Calculus II (MAT 1600).

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.

CURRENT

Kingsborough Community College
Of The City University of New York

Department of Mathematics & Computer Science

1. **Department, Course Number and Title**
   Department of Mathematics and Computer Science, Mathematics 16, Calculus II

2. **Distribution Requirements for Groups I-V**
   This course fulfills part of the Group V requirement for mathematics and science.

3. **Demonstration of Course Transferability**
   Course equivalencies for Kingsborough's Mathematics 16 at Brooklyn College are as follows:

   Brooklyn College: Calculus II, 4 credits
   Queens College: Calculus, 4 credits
   City College: Calculus II, 4 credits
   Hunter College: Calculus with Analytic Geometry II, 4 credits
   Baruch College: Elementary Calculus II, 4 credits
   Lehman College: Calculus II, 4 credits
   College of Staten Island: Analytic Geometry and Calculus II, 3 credits
   New York City Technical College: Analytic Geometry and Calculus II, 4 credits
   York College: Analytic Geometry and Calculus II, 4 credits
   John Jay College of Criminal Justice: Calculus II, 3 credits

4. **Bulletin Description of Course**
   A second course in the calculus of functions of one variable. Integrals, area, volume, and arc length; physical applications; exponential and logarithmic functions and applications; L'Hospital's rule; trigonometric and inverse trigonometric functions; integration techniques.

5. **Number of Weekly Class Hours**
   Four hours per week

6. **Number of Credits**
   Four credits

7. **Prerequisites**
   Mathematics 10 and Mathematics 15

8. **Justification for Course and Expected Enrollment**
   Mathematics 16 is an essential tool for the study of Computer Science, Economics, Engineering, Mathematics, Physics, Chemistry, and Biology.

Mathematics 16 will have an enrollment of approximately 100 students in the Fall and Spring semesters and 35 students in the Winter and Summer semesters.

9. **Course Withdrawals**

None

10. **CPI Requirements**

Mathematics 16 fulfills one CPI requirement in the area of Mathematics or as an elective.

11. **Field Work, Internship or Independent Study**

N/A

12. **Textbook**

Calculus (Alternate 6th edition) by Larson, Hostetler, & Edwards (Houghton-Mifflin, 1998), plus Study Guide ISBN # 0395889022

13. **Required Course for the Following Majors**

Computer Science, Engineering, and Mathematics

14. **Specify If Course Is Open Only to Selected Students**

Mathematics 16 is open to all students who meet the prerequisites.

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

Students will be able to:

a. understand and differentiate exponential, logarithmic and trigonometric functions.
b. understand and calculate definite and indefinite integrals of rational, exponential, logarithmic and trigonometric functions.
c. understand and calculate the area between two curves.
d. understand and calculate volume by the disk and shell methods.
e. understand and calculate arc length.
f. understand and calculate work.
g. understand and solve problems in exponential growth and decay.
h. understand and calculate limits using L'Hospital's rule.
i. use integral tables.
j. understand and calculate improper integrals.
k. understand and calculate various properties of the conic sections (i.e. parabolas, ellipses and hyperbolas).

16. **Method of Teaching**

Classroom lectures.

17. **Assignments to Students**

Textbook exercises

18. **Method of Evaluating Learning**

Class examinations and final examination

19. **Topical Course Outline**

Lesson	Topic	Section
1	Review: the definite integral	5.3
2	Review: evaluating integrals	5.4-5.5
3	Area between two curves	6.1
4-5	Volume: the disc method	6.2
6	Volume: the shell method	6.3
7-8	Arc length (optional: surfaces of revolution)	6.4
9	Work	6.5
10	(optional)Fluid pressure	6.6
11	Examination	
12	Exponential functions	7.1
13-14	Derivatives and integrals of exponential functions	7.2
15	Inverse functions and their derivatives	7.3
16	Logarithmic functions	7.4
17	Derivatives of logarithmic functions	7.5
18	Integrals involving logarithmic functions	7.6
19	Exponential growth and decay	7.7
20	L'Hospital's rule	7.8
21	Examination	
22	Review: derivatives of trigonometric functions	8.3
23-24	Integrals of trigonometric functions	8.4
25-26	Inverse trigonometric functions and their derivatives	8.5
27	Integrals involving inverse trigonometric functions	8.6
28	(optional) Hyperbolic functions	8.7
29	Integration: basic formulas	9.1
30	Integration by parts	9.2
31-32	Trigonometric integrals	9.3
33	Examination	
34-35	Integration by trigonometric substitution	9.4
36-37	Integration by partial fractions	9.5
38	Using integral tables	9.6
39	Improper integrals	9.7
40	Parabolas	11.1
41	Ellipses	11.2
42	Hyperbolas	11.3
43	(optional) Rotation of axes	11.4
44	Examination	
45-48	Semester review	

20. Selected Bibliography

Mendelson, *3,000 Solved Problems in Calculus*, McGraw-Hill, 1988
Mendelson and Ayers, *Schaum's Outline of Calculus*, McGraw-Hill, 1999
Passow, *Schaum's Outline of Understanding Calculus Concepts*, McGraw-Hill, 1996

Revised 10/03
Mathematics 16
Syllabus developed by Dr. Stanley Rabinowitz

KINGSBOROUGH COMMUNITY COLLEGE
THE CITY UNIVERSITY OF NEW YORK

Proposed

COURSE SYLLABUS: MAT 1600

1. **DEPARTMENT, COURSE NUMBER, AND TITLE:**
   Department of Mathematics and Computer Science
   MAT 1600- Calculus II

2. **DOES THIS COURSE MEET A GENERAL EDUCATION/CUNY CORE CATEGORY? YES**
   - ☐ **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:**
   Brooklyn College: Calculus II, 4 credits
   College of Staten Island: MTH 232 Analytic Geometry and Calculus II, 3 credits
   New York City Technical College: MATH 20200: Calculus II, 3 credits
   John Jay College of Criminal Justice: MAT 242 Calculus II, 3 credits

4. **BULLETIN DESCRIPTION OF COURSE:**
   A second course in the calculus of functions of one variable. Integrals, area, volume, and arc length; physical applications; exponential and logarithmic functions and applications; L'Hospital's rule; trigonometric and inverse trigonometric functions; integration techniques.

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

1-credit:	☐ 1 hour lecture ☐ 2 hours lab/field/gym
2-credits:	☐ 2 hours lecture ☐ 1 hour lecture, 2 hours lab/field ☐ 4 hours lab/field
3-credits:	☐ 3 hours lecture ☐ 3 hours lecture, 1 hour recitation ☒ 2 hours lecture, 2 hours lab/field

	☐ 1 hour lecture, 4 hours lab/field ☐ 6 hours lab/field
4-credits:	☐ 4 hours lecture ☐ 3 hours lecture, 2 hours lab/field ☐ 2 hours lecture, 4 hours lab/field ☐ 1 hour lecture, 6 hours lab/field ☐ 8 hours lab/field
More than 4-credits:	☐ Number of credits: ____ (explain mix lecture/lab below) ___ Lecture ____Lab Explanation:_____

***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):** Grade of "C" or better in MAT 1500
   - **B. COREQUISITE(S):** N/A
   - **C. PRE/COREQUISITE(S):** N/A

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:** MAT 1600 will have an enrollment of approximately 100
   - **C. SUGGESTED CLASS LIMITS:** 30
   - **D. FREQUENCY COURSE IS LIKELY TO BE OFFERED:** Fall and Spring
   - **E. ROLE OF COURSE IN DEPARTMENT'S CURRICULUM AND COLLEGE'S MISSION**

   MAT 1600 is an essential tool for the study of Computer Science, Economics, Engineering, Mathematics, Physics, Chemistry, and Biology

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

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 edition) by Larson, Hostetler, & Edwards, (Houghton-Mifflin, 1998), plus Study Guide ISBN # 0395889022.

12. **REQUIRED COURSE FOR MAJOR OR AREA OF CONCENTRATION?**
    Computer Science, Engineering, and Mathematics

13. **IF OPEN ONLY TO SELECTED STUDENTS SPECIFY POPULATION:**

MAT 1600 is open to all students who meet the prerequisites

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

a. understand and differentiate exponential, logarithmic and trigonometric functions.
b. understand and calculate definite and indefinite integrals of rational, exponential, logarithmic and trigonometric functions.
c. understand and calculate the area between two curves.
d. understand and calculate volume by the disk and shell methods.
e. understand and calculate arc length.
f. understand and calculate work.
g. understand and solve problems in exponential growth and decay.
h. understand and calculate limits using L=Hospital=s rule.
i. use integral tables.
j. understand and calculate improper integrals.
k. understand and calculate various properties of the conic sections (i.e. parabolas, ellipses and hyperbolas).

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 Lecture and labs. In the labs students will practice performing relevant skills described in question #14.

16. ASSIGNMENTS TO STUDENTS: textbook exercises and projects.

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, class projects and exercises to further understanding during recitation and final examination.

18. TOPICAL COURSE OUTLINE FOR THE 12 WEEK SEMESTER (WHICH SHOULD BE SPECIFIC REGARDING TOPICS COVERED, LEARNING ACTIVITIES, AND ASSIGNMENTS):
A lesson number preceded by an L indicates a lab

Lesson	Topic	Section
L1	Review: the definite integral	5.3
L2	Review: evaluating integrals	5.4-5.5
3	Area between two curves	6.1
4-5	Volume: the disc method	6.2
6	Volume: the shell method	6.3
7-8	Arc length (optional: surfaces of revolution)	6.4
L9	Work Problems	6.5
10	(optional)Fluid pressure	6.6
11	Examination	
L12	Exponential functions	7.1
L13-14	Derivatives and integrals of exponential functions	7.2
15	Inverse functions and their derivatives	7.3
L16	Logarithmic functions	7.4

17	Derivatives of logarithmic functions	7.5
L18	Integrals involving logarithmic functions	7.6
L19	Exponential growth and decay	7.7
20	L'Hospital's rule	7.8
21	Examination	
22	Review: derivatives of trigonometric functions	8.3
L23-24	Integrals of trigonometric functions	8.4
25-26	Inverse trigonometric functions and their derivatives	8.5
27	Integrals involving inverse trigonometric functions	8.6
L28	(optional) Hyperbolic functions	8.7
L29	Integration: basic formulas	9.1
L30	Integration by parts	9.2
31-32	Trigonometric integrals	9.3
33	Examination	
L34-35	Integration by trigonometric substitution	9.4
36-37	Integration by partial fractions	9.5
L38	Using integral tables	9.6
39	Improper integrals	9.7
40	Parabolas	11.1
L41	Ellipses	11.2
42	Hyperbolas	11.3
L43	(optional) Rotation of axes	11.4
44	Examination	
L45-48	Semester review	

19. SELECTED BIBLIOGRAPHY AND SOURCE MATERIALS:

Mendelson, 3,000 Solved Problems in Calculus, McGraw-Hill, 1988

Mendelson and Ayers, Schaum's Outline of Calculus, McGraw-Hill, 1999

Passow, Schaum's Outline of Understanding Calculus Concepts, McGraw-Hill, 1996

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, Bruce, Calculus, Cengage Learning 2017.

Revised 01/2019
Syllabus developed by Dr. Stanley Rabinowitz