BOROUGH OF MANHATTAN COMMUNITY COLLEGE
The City University of New York
Department of Mathematics

Title of Course: Analytic Geometry & Calculus III Class Hours: 4

MAT 303 Laboratory Hours per Week: 2

Semester:

Instructor Information (Phone#, Office#, email):

Credits: 4

Course Description:
This is the third course of a three semester integrated study of analytic geometry and the concepts of differential and integral calculus. In this course the student is introduced to multivariable functions, with derivatives and integrals, and their applications. Topics include limits, derivatives (partial and directional), the gradient, double and triple integrals, alternate coordinate systems (polar, cylindrical, spherical) and derivatives and integrals in those coordinates, vector fields and their operators, the Fundamental Theorem of Line Integrals, Green's Theorem, and applications.
MAT 303 has a computer laboratory component. Students utilize computer software such as graphing packages, a computer algebra system, and a mathematical word processor to complete laboratory assignments associated with their calculus course.

Basic Skills:_____

Prerequisites: Calculus II (MAT 302) or the equivalent with departmental approval.

Corequisites: -

Student Learning Outcomes:

Course Student Learning Outcomes	**Measurements**
1. Students will be able to find parametric equations of curves in Cartesian and polar coordinates	**1.** Homework assignments and/or take home projects; Quizzes and/or Midterm Exams; Final Exam; Lab Projects.
2. Students will be to calculate and apply dot and cross products of vectors in 2 and 3 dimensions, to differentiate and integrate vector-valued functions.	**2.** Homework assignments and/or take home projects; Quizzes and/or Midterm Exams; Final Exam; Lab Projects.
3. Students will be able to calculate and apply partial derivatives.	**3.** Homework assignments and/or take home projects; Quizzes and/or Midterm Exams; Final Exam; Lab Projects.
4. Students will be able to set up and evaluate integrals in higher dimensions and various coordinate systems.	**4.** Homework assignments and/or take home projects; Quizzes and/or Midterm Exams; Final Exam; Lab Projects.

5. Students will learn to calculate and apply vector fields and vector field operators.	**5.** Homework assignments and/or take home projects; Quizzes and/or Midterm Exams; Final Exam; Lab Projects.
6. Students will learn to evaluate integrals using advanced versions of the Fundamental Theorem of Calculus, such as the Fundamental Theorem of Line Integrals and Green's Theorem.	**6.** Homework assignments and/or take home projects; Quizzes and/or Midterm Exams; Final Exam; Lab Projects.

General Education Outcomes and Assessment:

	General Education Learning Outcomes	**Measurements (means of assessment for general education goals listed in first column)**
X	**Communication Skills-** Students will be able to write, read, listen and speak critically and effectively.	Assignments and/or take home projects; exams and/or Midterm Exam; Final Exam and Lab Projects.
X	**Quantitative Reasoning-** Students will be able to use quantitative skills and the concepts and methods of mathematics to solve problems.	Assignments and/or take home projects; exams and/or Midterm Exam; Final Exam and Lab Projects.
X	**Scientific Reasoning-** Students will be able to apply the concepts and methods of the natural sciences.	Assignments and/or take home projects; exams and/or Midterm Exam; Final Exam and Lab Projects.
☐	**Social and Behavioral Sciences-** Students will be able to apply the concepts and methods of the social sciences.	
☐	**Arts & Humanities-** Students will be able to develop knowledge and understanding of the arts and literature through critiques of works of art, music, theatre or literature.	
X	**Information & Technology Literacy-** Students will be able to collect, evaluate and interpret information and effectively use information technologies.	Assignments and/or take home projects; exams and/or Midterm Exam; Final Exam and Lab Projects.
☐	**Values-** Students will be able to make informed choices based on an understanding of personal values, human diversity, multicultural awareness and social responsibility.	

Required Text:

Calculus: Early Transcendental Functions, 6th Edition, Ron Larson & Bruce Edwards; Brooks/Cole, Cengage Learning, 2014

Other Resources: -

Use of Technology (If Applicable):

Students will be using MAPLE™, a computer algebra system which will help them visualize various concepts developed in class

Evaluation and Requirements of Students:

At the beginning of the semester, the instructor will advise students of the determination of the final grade which will be based on class work, tests, and the final examination. Students are required to attend all scheduled classes

Outline of Topics

SECTION TOPIC	TEXT PAGES
Chapter 10: Conics, Parametric Equations and Polar Coordinates	
10.2 Plane curves and parametric equations	696 – 705
10.3 Parametric equations and calculus	706 – 714
10.4 Polar coordinates and polar graphs	715 – 724
10.5 Area and arc length in polar coordinates	725 – 733
Chapter 11: Vectors and the Geometry of Space	
11.1 Vectors in the Plane	748 – 757
11.2 Space coordinates and vectors in space	758 – 765
11.3 The dot product of two vectors	766 – 774
11.4 The cross product of two vectors in space	775 – 782
11.5 Lines and planes in space	783 – 793
11.6 Surfaces in space [optional]	794 – 803
Chapter 12: Vector-Valued Functions	
12.1 Vector-valued functions	816 – 823
12.2 Differentiation and Integration of Vector-Valued Functions	824 – 831
12.3 Velocity and Acceleration	832 – 840
12.4 Tangent vectors, normal vectors and curvature in space [optional]	841 – 850
12.5 Arc Length [required] and Curvature [optional]	851 – 862
Chapter 13: Functions of Several Variables	
13.1 Introduction of functions of several variables	868 – 879
13.2 Limits and continuity	880 – 889
13.3 Partial derivatives	890 – 899
13.4 Differentials	900 – 906
13.5 Chain Rules for Functions of Several Variables	907 – 914
13.6 Directional Derivatives and Gradients	915 – 926
13.7 Tangent Planes and Normal Lines	927 – 935
13.8 Extrema of functions of two variables	936 – 943
13.9 Applications of Extrema [optional]	944 – 951
13.10 Lagrange Multipliers	952 – 959
Chapter 14: Multiple Integration	
14.1 Iterated integrals and area in the plane	966 – 973
14.2 Double integrals and volume	974 – 985
14.4 Centers of mass and moments of inertia	994 – 1001
14.5 Surface Area	1002 – 1008
14.6 Triple integrals and applications	1009 – 1019
11.7 Cylindrical and Spherical Coordinates	804 – 810
14.7 Triple integrals in cylindrical and spherical coordinates	1020– 1026
Chapter 15: Vector Analysis	
15.1 Vectors fields	1040 – 1050
15.2 Line integrals	1051 – 1064
15.3 Conservative vector fields and independence of path	1065 – 1074
15.4 Green's Theorem	1075 – 1083
15.5 Parametric Surfaces [optional]	1084 – 1093
15.6 Surface Integrals [optional]	1094 – 1105
15.7 Divergence Theorem [optional]	1106 – 1113
15.8 Stokes' Theorem [optional]	1114– 1123

Suggested Calendar

HRS	SECTIONS	TOPICS
1	10.2	Plane curves and parametric equations
2	10.3	Parametric equations and calculus
1	10.4	Polar Coordinates and Polar Graphs
2	10.5	Area and Arc Length in Polar Coordinates
1.5	11.1	Vectors in the Plane
0.5	11.2	Space Coordinates and Vectors in Space
1	11.3	The Dot Product of Two Vectors
1	11.4	The Cross Product of Two Vectors
2	11.5	Lines and Planes in Space
	11.6	Surfaces in Space
1	12.1	Vector-Valued Functions
2	12.2	Differentiation and Integration of Vector-Valued Functions
1	12.3	Motion in Space: Velocity and Acceleration
	12.4	Tangent Vectors and Normal Vectors [optional]
1	12.5	Arc Length [required] and Curvature [optional]
2	13.1	Introduction to Functions of Several Variables
2	13.2	Limits and Continuity
2	13.3	Partial Derivatives
2	13.4	Differentials
1	13.5	Chain Rules for Functions of Several Variables
2	13.6	Directional Derivatives and Gradients
2	13.7	Tangent Planes and Normal Lines
2	13.8	Extrema of Functions of Two Variables
1	13.9	Applications of Extrema
2	13.10	Lagrange Multipliers
1	14.1	Iterated Integrals and Area in the Plane
1	14.2	Double Integrals and Volume
2	14.3	Change of Variables: Polar Coordinates
2	14.4	Center of Mass and Moments of Inertia
1	14.5	Surface Area
2	14.6	Triple Integrals and Applications
1	11.7	Cylindrical [required] and Spherical [optional] Coordinates
1	14.7	Triple Integrals in Cylindrical [required] and Spherical [optional] Coordinates
	14.8	Change of Variables: Jacobians [optional]
2	15.1	Vector Fields
2	15.2	Line Integrals
1	15.3	Conservative Vector Fields and Independence of Path
2	15.4	Green's Theorem
	15.5	Parametric Surfaces [optional]
	15.6	Surface Integrals [optional]
	15.7	Divergence Theorem [optional]
	15.8	Stokes' Theorem [optional]

BMCC is committed to the health and well-being of all students. It is common for everyone to seek assistance at some point in their life, and there are free and confidential services on campus that can help.

Single Stop www.bmcc.cuny.edu/singlestop, room S230, 212-220-8195. If you are having problems with food or housing insecurity, finances, health insurance or anything else that might get in the way of your studies at BMCC, come by the Single Stop Office for advice and assistance. Assistance is also available through the Office of Student Affairs, S350, 212-220-8130.

Counseling Center www.bmcc.cuny.edu/counseling, room S343, 212-220-8140. Counselors assist students in addressing psychological and adjustment issues (i.e., depression, anxiety, and relationships) and can help with stress, time management and more. Counselors are available for walk-in visits.

Office of Compliance and Diversity www.bmcc cuny.edu/aac, room S701, 212-220-1236. BMCC is committed to promoting a diverse and inclusive learning environment free of unlawful discrimination/harassment, including sexual harassment, where all students are treated fairly. For information about BMCC's policies and resources, or to request additional assistance in this area, please visit or call the office, or email olevy@bmcc.cuny.edu, or twade@bmcc.cuny.edu. If you need immediate assistance, please contact BMCC Public safety at 212-220-8080.

Office of Accessibility www.bmcc.cuny.edu/accessibility, room N360 (accessible entrance: 77 Harrison Street), 212-220-8180. This office collaborates with students who have documented disabilities, to coordinate support services, reasonable accommodations, and programs that enable equal access to education and college life. To request an accommodation due to a documented disability, please visit or call the office.

College Attendance Policy
At BMCC, the maximum number of absences is limited to one more hour than the number of hours a class meets in one week. For example, you may be enrolled in a three-hour class. In that class, you would be allowed 4 hours of absence (not 4 days). In the case of excessive absences, the instructor has the option to lower the grade or assign an F or WU grade.

BMCC Policy on Plagiarism and Academic Integrity Statement
Plagiarism is the presentation of someone else's ideas, words or artistic, scientific, or technical work as one's own creation. Using the idea or work of another is permissible only when the original author is identified. Paraphrasing and summarizing, as well as direct quotations, require citations to the original source. Plagiarism may be intentional or unintentional. Lack of dishonest intent does not necessarily absolve a student of responsibility for plagiarism. Students who are unsure how and when to provide documentation are advised to consult with their instructors. The library has guides designed to help students to appropriately identify a cited work. The full policy can be found on BMCC's Web site, www.bmcc.cuny.edu. For further information on integrity and behavior, please consult the college bulletin (also available online).