Bronx Community College of the City University of New York

Department of Mathematics and Computer Science

**SYLLABUS: MTH 33** – Calculus and Analytic Geometry III (4 Credits – 6 Hours per week)

PREREQUISITE: MTH 32 – Calculus and Analytic Geometry II or equivalent; and CUNY English Proficiency, or ENG 100 or 110, if required

**TEXT**: Calculus: Early Transcendentals (Ninth Edition) by Stewart et al., Cengage Learning.

ISBN 978-1337613927

**Learning Objectives.** On successful completion of this course, students will be able to

* Work with curves in two- and three-dimensional Euclidean space
* Work with vectors in Euclidean n-space.
* Compute partial derivatives, use them to determine tangent plane and gradient, state, and apply the Chain rule when needed.
* State and apply the Implicit and Inverse Function theorems to determine if equations can be solved locally; find a derivative by implicit methods.
* Find maxima and minima of functions; use the Lagrange multipliers method when subject to constraints.
* Compute double and triple integrals over general elementary regions in the plane and space, respectively.
* Compute the Jacobian of a transformation and use it to change variables in double and triple integrals; choose the appropriate coordinate system (rectangular, polar, cylindrical, spherical) to compute double and triple integrals.
* Apply double and triple integrals to compute areas of surfaces, volumes of solids, averages, and solve geometrical and physical problems.
* Compute line and surface integrals of functions and vector fields; use these integrals to solve geometrical and physical problems.
* State and use the vector forms of the Fundamental Theorem of Calculus in the multivariable setting.
* Apply Vector Analysis to study physical and geometrical problems.

**SECTION TOPIC SUGGESTED EXERCISES**

**Week 1**

**CH 10: Parametric Equations and Polar Coordinates**

10.1 Curves Defined by Parametric Equations 669: 1-29 odd, 30-34

10.2 Calculus with Parametric Curves 680: 1-23 odd, 47, 49

10.3 Polar Coordinates 692: 111 odd, 1525 odd, 3349 odd

10.4 Calculus in Polar Coordinates 700: 131 odd, 49-53 odd

**SECTION TOPIC SUGGESTED EXERCISES**

**Week 2**10.5 Conic Sections 709: 147 odd

10.6 Conic Sections in Polar Coordinates 718: 121 odd

**CH 12: Vectors and the Geometry of Space**

12.1 Three-Dimensional Coordinate Systems 835/ 1-41 odd

12.2 Vectors 844/ 1-25 odd

**Week 3**

12.3 The Dot Product 853/ 1-53 odd

12.4 The Cross Product 862/ 1-37 odd, 45, 46

12.5 Equations of Lines and Planes 873/ 1-39 odd, 45-59 odd

Review

**Week 4**

Exam

**CH 13: Vector Functions**

13.1 Vector Functions and Space Curves 896/ 1-19 odd

13.2 Derivatives and Integrals of Vector Functions 903/ 1-27 odd

13.3 Arc Length and Curvature 914/ 1-33 odd

**Week 5**

**CH 14: Partial Derivatives**

14.1 Functions of Several Variables 947/ 1-15 odd

14.2 Limits and Continuity 960/ 1-33 odd

14.3 Partial Derivatives 970/ 9-35 odd, 41-63 odd

14.4 Tangent Planes and Linear Approximations 982/ 1-9 odd, 15-25 odd

**Week 6**

14.5 The Chain Rule 992/ 1-37 odd

14.6 Directional Derivatives and the Gradient Vector 1006/ 9-35 odd

14.7 Maximum and Minimum Values 1017/ 1-21 odd, 29-39 odd

**Week 7**

14.8 Lagrange Multipliers 1027/1-33 odd

Review

Exam

**Week 8**

**CH 15: Multiple Integrals**

15.1 Double Integrals over Rectangles 1049/ 1-33 odd

15.2 Double Integrals over General Regions 1060/ 1-39 odd

15.3 Double Integrals in Polar Coordinates 1068/ 1-27 odd

15.4 Applications of double integrals 1079/ 1-13 odd

**SECTION TOPIC SUGGESTED EXERCISES**

**Week 9**

15.5 Surface Area 1082/ 1-13 odd

15.6 Triple Integrals 1093/ 1-23 odd

15.7 Triple Integrals in Cylindrical Coordinates 1101/ 1-29 odd

15.8 Triple Integrals in Spherical Coordinates 1107/ 1-35 odd

**Week 10**

15.9 Change of variables in multiple integrals 1117/ 1-23 odd

Review

Exam

**Week 11**

**CH 16: Vector Calculus**

16.1 Vector Fields 1130/ 1-21 odd, 25-33 odd

16.2 Line Integrals 1142/ 1-23 odd

16.3 The Fundamental Theorem for Line Integrals 1152/ 1-31 odd

**Week 12**

16.4 Green’s Theorem 1160/ 1-17 odd

16.5 Curl and Divergence 1169/ 1-33 odd, 14

**Week 13**

16.6 Parametric Surfaces and Their Areas 1181/ 1, 3, 5, 13-25 odd, 33, 35, 39-49 odd

16.7 Surface Integrals 1193/ 5-31 odd

16.8 Stokes’ Theorem 1200/ 1-23 odd

**Week 14**

16.9 The Divergence Theorem 1207/ 1-21 odd, 27-31 odd

Review for the final exam

**Academic Integrity**

Academic dishonesty (such as plagiarism and cheating) is prohibited at Bronx Community College and is punishable by penalties, including failing grades, dismissal and expulsion. For additional information and the full policy on Academic Integrity, please consult the BCC College Catalog.

**Accommodations/Disabilities**

Bronx Community College respects and welcomes students of all backgrounds and abilities. In the event you encounter any barrier(s) to full participation in this course due to the impact of a disability, please contact the disAbility Services Office as soon as possible this semester.  The disAbility Services specialists will meet with you to discuss the barriers you are experiencing and explain the eligibility process for establishing academic accommodations for this course. You can reach the disAbility Services Office at: [disability.services@bcc.cuny.edu](mailto:disability.services@bcc.cuny.edu), Loew Hall, Room 211, (718) 289-5874.

08/ 08/ 16 (JP) - 08/18/22 (RG), 3/11/23 (IP)