Bronx Community College of the City University of New York
Department of Mathematics and Computer Science

SYLLABUS for MTH 35, Selected Topics in Advanced Calculus and Linear Algebra (4 credits-4 hours)
Prerequisite: MTH 33, Calculus III or equivalent; and CUNY English Proficiency, or ENG 100 or 110, if required
Main Text: *Calculus (or Multivariable Calculus), 7th Edition* by J. Stewart, published by Brooks/Cole
Supplementary Text on reserve at the library: *Vector Calculus, 5th Edition* by J.E. Marsden, A.J. Tromba

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

- Work with vectors in Euclidean n-space, multiply matrices and find their determinants.
- Compute the derivative matrix of multivariable and multivalued functions; state and apply the Chain rule to compute partial derivatives.
- 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 subject to constraints using the Lagrange multipliers method.
- 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, centers of mass, moments of inertia and gravitational potentials.
- Compute line and surface integrals of functions and vector fields; use these integrals to compute work, flux, and mass integrals on curves, surfaces and solids respectively.
- State and use the three vector forms of the Fundamental Theorem of Calculus in the multivariable setting: Green's, Stokes' and Gauss' (divergence) theorems.
- Determine when a vector field is conservative; find and use potential functions to compute work integrals along curves.
- Use differential forms to state Green's, Stokes' and Gauss' theorems under a single theorem.
- Apply Vector Analysis to study physical and geometrical problems described in the language of Partial Differential Equations.

General Education Proficiencies. Those addressed in this course are:

Reasoning and Analysis. a) Understanding and applying mathematical concepts, definitions and theorems in the formulation and solution of problems and b) by proving fundamental theorems.

Mathematical and Scientific Methods. Modeling, analyzing and solving real-life problems in order to understand the physical, natural and social worlds.

Communication Skills. a) Constructing, interpreting and applying symbolic and graphical representations of data and [1]b) constructing and presenting (generally in writing, but occasionally orally) a rigorous mathematical argument.

Information Literacy. Using technology appropriately to analyze and solve mathematical problems, for instance by graphing vector fields, surfaces and, in general, having students use technology to practice their skills at three-dimensional visualization, which is very important in this course.

Section	Topic	Suggested Exercises
	Maps from $\mathbb{R}^n$ to $\mathbb{R}^m$	
1.5[1]	n-Dimensional Euclidean Space	p. 86 1, 2, 4, 7, 8, 10, 11-15, 17
2.3[1]	Differentiation of maps from $\mathbb{R}^n$ to $\mathbb{R}^m$	p. 139 1-4, 7, 8, 13, 17
3.4[1] & 14.8	Lagrange Multipliers	p. 987 1-41 odd, 47
3.5[1]	The Implicit Function Theorem	p. 253 1-3, 5, 7, 9, 10, 12
15	**Multiple Integrals**	
15.1	Double Integrals over Rectangles	p. 1005 1-17 odd
15.2	Iterated Integrals:Fubini's Theorem	p. 1011 1-29 odd,35
15.3	Double Integrals over General Regions	p. 1019 1-31 odd, 43-55 odd
15.4	Double Integrals in Polar Coordinates	p. 1026 1-31 odd, 40, 41
15.5	Applications of Double integrals	p. 1036 1-19 odd
15.7	Triple Integrals	p. 1049 1-19 odd, 31
15.8	Triple Integrals in Cylindrical Coordinates	p. 1055 1-27 odd, 29
15.9	Triple Integrals in Spherical Coordinates	p. 1061 1-31 odd, 35
15.10	Change of Variables in Multiple Integrals	p. 1071 1-23 odd, 24, 28
	Review	p. 1073-1076
16	**Vector Calculus**	
16.1	Vector Fields	p. 1085 1-31 odd, 35, 36
16.2	Line Integrals	p. 1096 1-21 odd, 37, 39, 41, 52
16.3	The Fundamental Theorem for Line Integrals	p. 1106 1-25 odd, 29, 35, 36
16.4	Green's Theorem	p. 1113 1-21 odd
16.5	Curl and Divergence	p. 1121 1-21 odd, 12, 25-31, 33-38
16.6	Parameterized Surfaces and Their Areas	p. 1132 1, 3, 13-23 odd, 33-47 odd
16.7	Surface Integrals	p. 1144 1, 5-29 odd, 38, 39-45 odd
16.8	Stokes' Theorem	p. 1151 1-11 (a) odd, 13, 15, 19
16.9	The Divergence Theorem	p. 1157 1-13 odd, 23, 25-30
8.5[1]	Applications to Partial Differential Equations	p. 585 1, 3, 7-10
8.6[1]	Differential Forms	p. 603 1, 3, 4, 5, 6, 8, 9, 11, 12
	Review	p. 1161-1162

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.

[1] from the Supplementary Text

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, Loew Hall, Room 211, (718) 289-5874.

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updated EA 8/22 for prereq