Vector Calculus Syllabus

**MAT 226 Vector Calculus:** 4 hours, 4 credits. Vectors in two and three dimensions, equations of lines and planes, functions of several variables, partial differentiation, directional derivatives, gradients, optimization with Lagrange multipliers, multiple integration, line integrals and vector fields

**Prerequisite:** A grade of C (or better) in MAT 176.

**Instructor:** Your instructor will provide contact information, office hours and meeting times for your section.

Grading Policy

**Expectations:** Students are expected to learn both the mathematics covered in class and the mathematics in the textbook and other assigned reading. Completing homework is part of the learning experience. Students should review topics from prior courses as needed using old notes and books.

**Homework:** Approximately two hours of homework will be assigned in each lesson as well as additional review assignments over weekends.

**Exams:** There will be one midterm exam and a final exam.

**Grades:** The precise grading policy for your section will be distributed by your instructor.

Materials, Resources and Accommodating Disabilities

**Textbook:** Larson, Hostetler and Edwards, Calculus (Early Transcendentals) Ed. 4, Houghton Mifflin

**Technology:** Students should purchase a basic scientific calculator able to compute trigonometric and exponential functions, but unable to complete algebraic manipulations and take derivatives.

**Tutoring:** Departmental tutoring is available in the Math Lab on the 2nd floor of Gillet Hall.

**Reliable Web Resources:** See http://comet.lehman.cuny.edu/calculus

**Reserve:** Selected books have been placed on reserve in the library.

**Accommodating Disabilities:** Lehman College is committed to providing access to all programs and curricula to all students. Students with disabilities who may need classroom accommodations are encouraged to register with the Office of Student Disability Services. For more info, please contact the Office of Student Disability Services, Shuster Hall, Room 238, phone number, 718-960-8441.

Course Objectives

At the end of the course students should be able to:

1. Graph and determine the equations for lines and planes (as part of dept objectives in math a & b)
2. Compute sums, differences, dot products and cross products of vectors (a)
3. Determine velocities and accelerations of vector-valued position functions (a, b & c)
4. Find level sets, gradients and tangent planes to functions of several variables (a, b & e)
5. Apply the method of Lagrange Multipliers (a,b & c)
6. Apply Fubini's Theorem and Green's Theorem to integrate functions and fields (a, b & e)

These objectives will be assessed on the final exam along with other important techniques.
Course Calendar

This course and its corequisite are carefully timed to match topics, so stay on schedule.

Lesson I: Vectors, Plotting in 3D, 11.1-11.2
(11.1/ 1, 5, 13, 21, 23, 33, 43. 11.2/ 1,3,5,11,29, 33, 37, 65.)

Lesson II: Dot and Cross Products 11.3-11.4
(11.3/ 3, 9, 17, 21, 47, 77. 11.4/ 1, 3, 5, 9, 11, 35, 47, 63.) Review HW: Differentiation Chapter 3

Lesson III: Parametric Equations and Polar Coordinates 10.2, 10.4
(10.2/ 1,3,15, 39, 41, 42, 69. 10.4/ 1, 11,21,25,27, 29, 33, 35, 37.)

Lesson IV: Lines and Planes 11.5
(11.5/ 1, 3, 5, 11, 13, 19, 25, 27, 33, 37, 45, 51, 81.)

Lesson V: Hyperboloids, Paraboloids 11.6 (if time)
(11.6/ 1, 3, 5, 7, 9, 11, 23.) Review HW: limits 2.2-2.4

Lesson VI: Cylindrical and Spherical Coordinates 11.7
(11.7/ 5, 11, 15, 17, 23, 27, 39, 43, 45, 53.)

Lesson VII: Catch-up Lesson  
Review HW: Product rule 3.1-3.3 (3.2/ex2, ex3, ex5, ex6, ex7, ex8, ex9)

Lesson VIII: Vector valued functions, limits and continuity 12.1
(12.1/ 9, 11, 15, 17, 19, 21, 23, 59, 69.)

Lesson IX: Differentiation 12.2
(12.2/ 1,5,11, 17, 19, 41, 49, 59, 61 41.) Review HW: Chain Rule 3.4

Lesson X: Velocity and Acceleration, 12.3
(12.3/ 1, 3, 5, 9, 15, 17, 45, 47.)

Lesson XI: Tangent Vectors and Arc length 12.4-12.5
(12.4/ 5, 7, 13, 23. 12.5/ 5, 7, 9, 11.) Review HW: Surfaces 11.6

Lesson XII: Functions of several variables 13.1
(13.1/ 11, 13, 17, 19, 21, 27, 29, 31, 33, 35, 37, 67, 79.)

Lesson XIII: Level sets, 13.1,
(13.1/ 45, 47, 49, 51, 53, 69, 71, 73, 83, 85, 87.)
Review HW: Dot products and planes 11.3-11.5

Lesson XIV: Partial derivatives 13.3, (13.2 if time)
(13.3/ 1, 3, 5, 7, 19, 25, 29, 33, 35, 51, 55, 59.)

Lesson XV: Gradients 13.6 (and the chain rule 13.5)
(13.6/ 3, 15, 29, 37, 51, 55 (sketch and check), 63, 71 Read in 13.5: example 1, example 3, Thm 13.7, example 4; Do 13.5/ 1, 5, (7, 9))
Review HW: Extrema in One Variable 4.1

Lesson XVI: Tangent Planes 13.7 (go over theorems 13.6 and 13.7 in 13.5)
(13.7/ 5, 7, 11, 13, 15, 17, 55.)

Lesson XVII: Extrema and Saddle Points 13.8
(13.8/ 1, 9, 13, 27, 31, 37, 45.) Review HW: for midterm

Lesson XVIII: Maximizing Profit 13.9 (if time) as a review
( Read example 5 of 13.8, do 13.8/53, 55, 59.)
Read examples 1 and 2 of 13.9 and do 13.9/ 1, 3, 19, 21 read example 3 of 13.9 and do 27 and 29. )

Lesson XIX: Midterm Exam
Review HW: Definition of Integration 5.2-5.3

Lesson XX: Lagrange Multipliers 13.10
(Do examples in 13.10 and check yourself, 13.10/ 5, 13,)

Lesson XXI: More Lagrange Multipliers 13.10
(13.10/ 15, 17, 25) Review HW: Techniques of Integration 5.5

Lesson XXII: Iterated Integrals and Area 14.1
( 14.1/ 1, 3, 5, 7, 9, 11, 15, 21, 27, 29, 31, 39, 41, 43, 45, 47, 49, 53, 59 )

Lesson XXIII: Double Integrals 14.2
(14.2/ 7, 9,11,13, 15, 17, 19,)

Lesson XXIV: More integration 14.2

Lesson XXV: Integration and polar coordinates 14.3
( 14.3/ 9, 13, 15, 17, 23, 33, 55, 57 ) Review HW: Vector-valued functions 12.2-12.3

Lesson XXVI: Vector Fields and Line Integrals 15.1-15.2
(15.1/ 1, 3, 5, 7, 9, 11, 21, 23, 35. 15.2/ 1, 3, 7, 13, 27, 35.) Review HW: prep for final

Lesson XXVII: Path independence and Green’s Theorem 15.3-15.4 (if time)
(15.3/1, 5, 11, 25, 31. 15.4/ 1, 7, 11, 13, 21.)

Lesson XXVIII: Last class: Review for final

Final Exam: The Final Exam will be given during Finals Week covering the entire course especially topics needed in future courses.

This syllabus and others are available at: http://comet.lehman.cuny.edu/calculus/.

Department of Mathematics and Computer Science, Lehman College, City University of New York