University at Buffalo
GIFTED MATH PROGRAM

Course VI Curriculum

Fall Semester

Course Number:	MTH 241
Course Title:	College Calculus 3
Credit Hours:	4.0
Textbook:	Stewart, ***Calculus Early Transcendentals, MTH241*** (8^{th} edition, UB custom), Cengage Learning
Catalogue Description:	Geometry and vectors of n-dimensional space; Green's theorem, Gauss theorem, Stokes theorem; multidimensional differentiation and integration; application to 2- and 3-D space.
Prerequisite:	MTH 142 with recommended grade of *"C"* or higher
Syllabus:	MTH 241 covers Chapters 12 through Chapter 16 of the text.

Week	***Section***	***Topics***
1	12.1 – 12.4	Three-Dimensional Coordinate Systems, Vectors, Dot Product, Cross Product
2	12.5 – 12.7	Equations of Lines and Planes, Cylinders and Quadratic Surfaces, Cylindrical and Spherical Coordinates
3	13.1 – 13.3	Vector Functions and Space Curves, Derivatives and Integrals of Vector Functions, Arc Length and Curvature
4	13.4, 14.1	Motion in Space: Velocity and Acceleration; Functions of Several Variables
5	14.2 – 14.4	Limits and Continuity, Partial Derivatives, Tangent Planes and Linear Approximation
6	14.5 – 14.7	Chain Rule, Directional Derivatives and Gradient Vector, Maximum and Minimum Values
7	14,8, 15.1-15.2	Lagrange Multiplier, Double Integrals over Rectangles, Iterated Integrals
8	15.3 – 15.5	Double Integrals over General Regions, Double Integrals in Polar Coordinates, Applications of Double Integrals
9	15.6 – 15.8	Surface Area, Triple Integrals, Triple Integrals in Cylindrical and Spherical Coordinates *Option: Section 15.9 Change of Variables in Multiple Integrals*
10	16.1 – 16.4	Vector Fields, Line Integrals, Fundamental Theorem for Line Integrals, Green's Theorem
11	16.5 – 16.7	Curl and Divergence, Parametric Surfaces and their Area, Surface Integrals
12	16.8 – 16.9	Stokes' Theorem, Divergence Theorem

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Spring Semester

Course Number:	MTH 309
Course Title:	Introduction to Linear Algebra
Credit Hours:	4.0
Textbook(s):	David Lay, ***Linear Algebra and its Applications***, 5th edition, Addison Wesley (UB 3rd custom edition)
Catalogue Description:	Linear equations, matrices, determinants, vector spaces, linear mappings, inner products, eigenvalues, eigenvectors.
Prerequisite:	MTH 142 (Calculus 2) or MTH 192 (Discrete Math 2)
Syllabus:	Chapters 1 through 7 as specified below.

Section	***Title***	***Topics***
1.1 – 1.8	Linear Equations in Linear Algebra	Systems of linear equations. Row reduction and echelon forms. Vector equations. Ax-b. Solution sets of linear systems. Applications of linear systems. Linear independence. Linear transformations.
2.1 – 2.3 2.8 – 2.9	Matrix Algebra	Matrix operations. Inverse of a matrix. Characterizations of invertible matrices. Subspaces of R^n. Dimension and rank.
3.1 – 3.2	Determinants	Introduction to determinants. Properties of determinants.
4.1 – 4.6	Vector Spaces	Vector spaces and subspaces. Null spaces, column spaces, and linear transformations. Linearly independent sets, bases. Coordinate systems. Dimension of a vector space. Rank.
5.1 – 5.5	Eigenvalues and Eigenvectors	Eigenvectors and eigenvalues. Characteristic equation. Diagonalization. Eigenvectors and linear transformations. Complex eigenvalues.
6.1 – 6.5	Orthogonality and Least Squares	Inner product, length, orthogonality. Orthogonal sets. Orthogonal projections. Gram-Schmidt process. Least squares problem.
7.1 – 7.2	Symmetric Matrices and Quadratic Forms	Diagonalization of symmetric matrices. Quadric forms.