1. **MA 26100 – Multivariate Calculus**

2. **Credits and contact hours:**
   4 credits
   Lecture – 3 days per week at 50 minutes for 15 weeks.
   Recitation - 1 day per week at 50 minutes for 15 weeks.

3. **Instructor's or course coordinator's name:** Dominic James Naughton, Jingshuang Chen, Seongmin Jeon, Carlos Emilio Salinas, Pavel Coupek …

4. **Textbook(s):** *Bundle: Calculus: Early Transcendentals, Loose-Leaf Version, 8th + Enhanced WebAssign Printed Access Card for Calculus, Milti-Term Courses,* James Stewart, Brooks Cole, 8th Edition, (Notes-other options include access sheet for e-book (9781285858265) or buying e-book & homework access directly through WebAssign.) ISBN 9781305616691
   a. **Other supplemental materials:** None

5. **Specific course information**
   a. **Catalog description:** Planes, lines, and curves in three dimensions. Differential calculus of several variables; multiple integrals. Introduction to vector calculus. Not open to students with credit in MA 17400 or 27100. Typically offered Fall Spring Summer.
   b. **Prerequisites or co-requisites:** MA 16200 Minimum Grade of C- or MA 16600 Minimum Grade of C- or MA 17300 Minimum Grade of C- or MA 18100 Minimum Grade of C- or MATH 16400 Minimum Grade of C- or MA 17100 Minimum Grade of C- or MA 16400 Minimum Grade of C- or MATH M2160 Minimum Grade of C- or MA 16900 Minimum Grade of C-
   c. **Course status:**

6. **Specific goals for the course**
   a. **Student Learning Outcomes:**
      1. Know the equations for lines, planes and quadric surfaces in three dimensional space, and understand how these equations relate to the geometry.
      2. Understand the relationship between vector functions and parametrized motion; know how to calculate velocity, acceleration, arc length and curvature.
      3. Know the meaning of partial derivatives and how to calculate them. Know the multivariable chain rule.
      4. Know the meaning of the gradient, how to calculate it, and how to apply it to directional derivatives and maximum and minimum values.
      5. Understand the meaning of double and triple integrals; know how to compute them and how to apply them.
      6. Understand the meaning of vector fields and line integrals. Know Green's theorem and be able to apply it.

7. Understand the meaning of surface integrals and know how to calculate them. Know Stokes' theorem and be able to apply it.

b. Relationship of course to program outcomes:

7. Topics

Week	
1	Three-Dimensional Coordinate Systems. Vectors. The Dot Product. The Cross Product. The Geometry of a Tetrahedron. Equations of Lines and Planes. Putting 3D in Perspective.
2	Cylinders and Quadric Surfaces. Vector Functions and Space Curves. Derivatives and Integrals of Vector Functions.
3	Arc Length and Curvature. Motion in Space: Velocity and Acceleration. Kepler's Laws.
4	Functions of Several Variables. Limits and Continuity. Partial Derivatives.
5	Tangent Planes and Linear Approximations. The Speedo LZR Racer. The Chain Rule.
6	Directional Derivatives and the Gradient Vector. Maximum and Minimum Values. Designing a Dumpster. Quadratic Approximations and Critical Points.
7	Lagrange Multipliers. Double Integrals over Rectangles.
8	Double Integrals over Rectangles. Double Integrals over General Regions. Double Integrals in Polar Coordinates. Applications of Double Integrals. Surface Area.
9	Triple Integrals. Volumes of Hyperspheres. Triple Integrals in Cylindrical Coordinates. The Intersection of Three Cylinders.
10	Triple Integrals in Spherical Coordinates. Roller Derby. Change of Variables in Multiple Integrals. Vector Fields.
11	Line Integrals. The Fundamental Theorem for Line Integrals. Green's Theorem.
12	Curl and Divergence.
13	Parametric Surfaces and Their Areas. Surface Integrals.
14	Stokes' Theorem. Three Men and Two Theorems. The Divergence Theorem.
15	Review