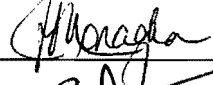# COUNTY COLLEGE OF MORRIS
Course Information Outline

Course Title _Calculus III_   **PREFIX&NUMBER** _MAT 230_

Lecture Hours _60_ **Laboratory Hours** _0_ **Credit Hours** _4_ **Course Fee** _None_

Department Chairperson Approval _J. Monaghan_   **Date** _05-25-2010_

Division Dean Approval _P. Enright_   **Date** _5-28-10_

1. Catalog Course Description
A continuation of Analytic Geometry and Calculus II, which includes analytic geometry in three dimensions, functions of several variables, partial derivatives, multiple integrals, vectors, and an introduction to vector analysis.

2. Prerequisite(s)
MAT 132 (grade of "C" or better).

3. Co-requisite(s)
None

4. Textbooks
Stewart, _Multivariable Calculus – Concepts and Contexts_, 4th ed. (Brooks Cole, 2005).

5. Supplementary Books and/or Materials
None

6. Specialized equipment, supplies, facilities, for classes limited by enrollment or restricted by accreditation and/or equipment limitations. (Information will be used to determine differential funding category.)
None

7. Course Content (List of Topics)
- Introduction; _XYZ_ coördinates, spheres
- Vectors; scalar (dot) and vector (cross) products
- Lines and planes in three dimensions
- Functions and surfaces, quadric surfaces
- Cylindrical and spherical coördinates
- Vector functions, space curves
- Derivatives and integrals of vector functions
- Arc length, curvature, torsion (p. 716), rectifying plane
- Motion in space, parametric surfaces
- Functions of several variables, limits, continuity
- Partial derivatives, tangent planes, linear approximations

- Chain Rule, directional derivatives, the gradient
- Maxima and minima, Lagrange multipliers
- Double integrals and applications
- Surface areas
- Triple integrals in Cartesian, cylindrical and spherical coördinates
- Vector fields
- Line integrals, the Fundamental Theorem
- Green's Theorem
- The curl, the divergence and the Laplace operator
- Surface integrals
- Stokes's Theorem, the Divergence Theorem

8.   Statement of Course LEARNING OUTCOMES
- **Recognize** and **manipulate** vectors in two and three dimension
- **Calculate** the equations of lines and planes in three dimension
- **Recognize, classify,** and **illustrate** functions and surfaces in three dimension
- **Distinguish** and **relate** rectangular, cylindrical, and spherical coordinates
- **Calculate** limits, derivatives, and integrals of functions of several variables
- **Apply** partial differentiation to locate critical points
- **Apply** multiple integration to calculate areas and volumes
- **Define** vector fields and **calculate** line and surface integrals
- **State** and **interpret** Green's, Stokes's, and the divergence theorems

9.   Statement of Relation to Curriculum(s)
MAT 230 is sometimes required in the mathematics program and is prerequisite to PHY 232 (Engineering Physics III).

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COUNTY COLLEGE OF MORRIS
COURSE INFORMATION OUTLINE

Course__Calculus III_____Cat. No.___MAT 230_____

Clinical

Class Hours_____60____ Laboratory Hours___0____ Credit Hours_____4__ Course Fee___None_____

Recitation

Faculty Course Coordinator_____None_____

Department Chairperson Approval__J. R. Monaghan_____Approval Date____8-18-97

Division Dean Approval__M. C. Ayres_____Approval Date___8/31/97

1. Prerequisite (Last Course or Courses)__MAT 132_____

2. Co-requisite___None_____

3. Textbooks: Anton, _Calculus with Analytic Geometry, 5th ed._ (Wiley), ISBN 0-471-59495-4

4. Supplementary Books : College bookstore may have student solutions manual and other aids.

5. Supplementary Materials: None

6. Specialized equipment, supplies, facilities, for classes limited by enrollment or restricted by accreditation and/or equipment limitations. (Information will be used to determine differential funding category.): None

7. Statement Course Objectives: MAT 230 prepares students for advanced mathematics courses and for courses in other sciences, such as Engineering Physics III.

8. Statement of Relation to Curriculum(s): MAT 230 is sometimes required in the mathematics program and is prerequisite to PHY 232 (Engineering Physics III).

9. Catalog Course Description (Please include when course will be offered -- Fall, Spring, Summer, etc.): "A continuation of Analytic Geometry and Calculus II, which includes analytic geometry in three dimensions, functions of several variables, partial derivatives, multiple integrals, vectors, and an introduction to vector analysis." MAT 230 is offered in the fall day and evening and the summer evening sessions.

10. Course Outline

Syllabus

Period	Text sections	Topics
1	14.1	Intro.; 3-dimensional space; spheres, cylinders
2	14.2	Vectors in 2- and 3-dimensional space
3	14.3-4	Dot and cross products, direction cosines and angles
4- 5	14.5-6	Straight lines and planes
6- 7	14.7-8	Quadric surfaces; cylindrical, spherical coördinates
8		Quiz no. 1
9-10	15.1-2	Vector-valued functions, position vectors
11	15.3	Change of parameter, arc length
12-14	15.4-6	Unit tangent, normal, and binormal vectors*; curvature and torsion; motion on a path**
15		Quiz no. 2
16	16.1	Functions of several variables, surfaces
17	16.2	Limits, continuity
18-19	16.3-4	Partial derivatives, Laplace's equation, Chain Rule
20	16.5	Tangent planes, total differentials
21	16.6-7	Directional derivatives, gradients
22	16.8	Functions of n variables
23-24	16.9-10	Maxima and minima; Lagrange multipliers
25		Review
26		Quiz no. 3
27-29	17.1-3	Double integrals in rectangular and polar coördinates
30-32	17.4-5	Surface area, triple integrals, volumes
33	17.6	Centroids, Theorems of Pappas
34	17.7	Triple integrals in cylindrical, spherical coördinates
35		Review
36		Quiz no. 4
37	18.1	Vector fields
38-39	18.2-3	Line integrals, independence of path, conservative fields
40-42	18.4-6	Green's Theorem, surface integrals, flux
43-44	18.7-8	Divergence Theorem, Stokes's Theorem, circulation
45		Review or quiz no. 5

*$B = T \times N$, torsion = magnitude of dB/ds.
**Students should read sect. 15.7 (Kepler's Laws), of historical interest

MAT230 - CALCULUS III   ι   10/3/85
4 hrs/wk - 4 cr.

Catalog description: A continuation of Analytic Geometry and Calculus II, which includes analytic geometry in three dimensions, partial derivatives, multiple integrals, vectors, and an introduction to vector analysis.

Pre-requisite: MAT132.

Text: Thomas and Finney, _Calculus and Analytic Geometry_, 6th ed. (Addison-Wesley).

Supplementary materials: None.

Role of course: Required in the Mathematics program (2150) and the Engineering Science program (2180). Elective in the following programs: Business Administration (2110), Humanities/Social Science (1130), Humanities/Art (1140), Mathematics/Physical Science (2151), Humanities/Music (1190), and these Honors programs: the Humanities/Social Science option (1131) and the Mathematics/Science option (2153). Corequisite to PHY132. Prerequisite for PHY231.

Syllabus

Period	Text sections	Topics
1- 3	13.1-3	Intro.; vectors in the plane; parametric equations
4	13.4-5	Space coordinates, vectors and distance in space
5	13.6-7	Scalar and vector products, direction cosines and angles
6- 7	13.8-9	Lines and planes, triple products
8	13.10-11	Cylinders, quadric surfaces
9		Quiz no. 1
10	14.1	Derivatives of vector functions
11-13	14.2-4	Tangential vectors, v, a, arc length, curvature, etc.
14	14.5	Derivatives of vector products; tang. and normal comps.
15	14.6	Unit vectors in polar coordinates
16		Quiz no. 2
17-18	15.1-2	Functions of several variables, limits, continuity
19-20	15.3-4	Partial derivatives, chain rule
21	15.5	Nonindependent variables
22	15.6	Gradients, directional derivatives, tangent plane
23-24	15.7-8	Higher partial derivatives, linear approx., increments
25-26	15.9-10	Maxima, minima, saddle pts., Lagrange multipliers
27-28	15.11-12	Exact differentials, method of least squares
29		Quiz no. 3
30	16.1-2	Intro. to multiple integrals; double integrals
31-32	16.3-5	Area and other applications; polar coordinates
33-34	16.6-8	Triple integrals, applications; other coord. systems
35	16.9	Surface area
36-37		Review; quiz no. 4
38-40	17.1-3	Vector fields, surface integrals, line integrals, work
41	17.4	2-dim. fields, flux across a plane curve
42-44	17.5-7	Green's theorem, divergence theorem, Stokes's theorem
45		Review or quiz no. 5