FRESNO CITY COLLEGE
COURSE OUTLINE OF RECORD

Course Subject and Number
Mathematics 6

Course Title
Mathematical Analysis III

Discipline(s)
Mathematics

Term Effective:
Fall 2001

Catalog Description	[X] no change	[ ] revised/clarified	[ ] new	(check one)
Prerequisite	[X] no change	[ ] revised/clarified	[ ] new	(check one)
Corequisite	[X] no change	[ ] revised/clarified	[ ] new	(check one)
Advisory	[X] no change	[ ] revised/clarified	[ ] new	(check one)
Units, hours, repeatability, credit/no credit, number of weeks	[X] no change	[ ] revised	[ ] new	(check one)

(If revised is checked, underline item(s) revised above)

4 unit(s) **4** lecture hour(s) **0** laboratory hour(s) **0** number of repeats (maximum = 3)

_____ credit/no credit only **18** number of weeks

Prerequisite: Math 5B or equivalent.

Corequisite: None

Advisory: Eligibility for English 25 and 26 or English 53 or ESL 67 and 68 recommended.

Description: Solid analytical geometry; partial differentiation; integral calculus of multi-variable functions; two and three dimensional vectors; vector valued functions; topics in vector calculus including Green's, Divergence, and Stoke's Theorems. (CAN MATH 22)

Entry Level Skills: Upon entering the course, the student should be able to:

1. integrate polynomials, exponential, logarithmic, inverse trigonometric, trigonometric, and hyperbolic functions;
2. apply principles of integration to solve unfamiliar problems, to analyze and identify techniques to be used including substitution (both algebraic and trigonometric), do partial fractions, do integrations by parts, use quadratic expressions, and use numerical methods;
3. solve first and second order differential equations by analytic, numerical, and graphical methods;
4. solve problems with infinite series, including Taylor and Fourier Series;
5. use the reading process: preread, read, and reread;
6. read actively by previewing, questioning, paraphrasing, and tracing clues;
7. demonstrate positive, success-oriented attitudes towards reading; and
8. comprehend academic reading materials associated with success in a degree applicable course.

Requested Credit Classification (check all that apply)

- [X] Degree Applicable
- [ ] Noncredit
- [ ] Nondegree Applicable
- [ ] Transfer Level

- [ ] Course contains an international component.
- [ ] Course contains American pluralism and identity content.

Expected Outcomes/Objectives: Upon successful completion of the course, the student will be able to:

1. **identify graphs and solve problems with various types of functions in rectangular, polar, and parametric form;**
2. **differentiate and integrate multivariable functions by analytic, graphical, and numerical methods;**
3. **solve problems by use of vector representation as well as differentiate and integrate vector valued functions;**
4. **solve line and surface integrals; solve problems in vector calculus by use of Green's, Stoke's, and Divergence Theorems;**
5. **solve problems with Taylor series and Taylor polynomials; and**
6. **present solutions to problems in essay form.**

Texts, Other Readings, and Materials:

Text(s)

McCallum, William, et al., Multivariable Calculus, 5th Edition, Wiley: New York, NY, 1997.

Reference:

Stewart, James, Journey Through Calculus, CD Rom, Brooks/Cole Publishing: Pacific Grove, CA, 1999.
Stewart, James, Single Variable Calculus, 4th Edition, Brooks/Cole Publishing: Pacific Grove, CA, 1999.

☒ **Primarily College Level**

☐ **Primarily Not College Level**

Professional Judgment
(How Determined)

Out-of-Class Assignments **8** **hours per week (or equivalent)**

☐ ***Permissible exceptions to the common interpretation as stated are as follows: (AR 7200)*** ***1 2 3 4*** ***(circle one)***

List types:

1. **Read and study text material.**
2. **Work problems assigned from the text.**
3. **Solve problems using graphing calculators and/or computers.**

☒ **Class participation and assignments require and develop critical thinking (see Expected Outcomes/Objectives). Describe how:**

Students need to make an immediate connection between the topics discussed and the problem solving methods being learned.

Students must analyze problems to identify the desired outcomes. The student must then decide on which calculus principles to apply and in what order to obtain valid conclusions.

[X] **Primarily College Level**

[ ] **Not Primarily College Level**

[X] **2 hours of independent work done out of class per each hour of lecture or class work, or 3 hours lab, practicum, or the equivalent per unit.**

[ ] **Ratio of amount of work per unit of credit required by curriculum committee for a nondegree credit course is met.**

Assessment:

Grades will be based upon:

[X] **ESSAY***

Although essay is appropriate for part of the grade, due to the largely computational nature of calculus it will not be at least 25% of the grade.

[X] **COMPUTATION***

[X] **NONCOMPUTATIONAL PROBLEM SOLVING***

Examples: Involves the proving of theorems and derivation of formulas.

[ ] **SKILL DEMONSTRATION**

Kind:

[ ] **MULTIPLE CHOICE**

[ ] **OTHER: Describe. (Examples: tests, quizzes, homework)**

***For degree credit: At least one of the first three boxes above must be checked, and if "essay" is <u>not</u> checked, it must be explained why essays are an inappropriate basis for at leat 25% of the grade in the course.**

Expanded Description of Content and Methods:

Content:

I. Three-Dimensional Space, Vectors — **4 1/2 weeks**

- **A. Three-dimensional cartesian coordinates**
- **B. Surface sketching of cylindrical surfaces**
- **C. Vectors**
- **D. Dot product, projections, and cross product**
- **E. Planes and lines**
- **F. Quadratic surfaces**

II. Partial Derivatives — **4 weeks**

- **A. Definition of partial derivative and geometric interpretation**
- **B. Total differential**
- **C. Directional derivatives and gradients**
- **D. Normals to surfaces, tangent lines and tangent planes**
- **E. Chain rules for partial derivatives**
- **F. Maxima, minima, and Lagrange Multipliers**

III. Multiple Integrals — **3 weeks**

- **A. The double integral, rectangular regions, and non-rectangular regions**
- **B. Double integrals in polar coordinates**
- **C. Applications for double integrals**
- **D. Monte-Carlo Methods**
- **E. Triple integration**
- **F. Centroids and center of gravity**
- **G. Cylindrical and spherical coordinates**
- **H. Change of variables - Jacobian**

IV. Parametric Representation — **1 1/2 weeks**

- **A. Parametrized curves and surfaces**
- **B. Vector valued functions**
- **C. Motion - velocity and acceleration**
- **D. Limits, derivatives and arclength**
- **E. Unit tanget and normal vectors**

V. Topics in Vector Calculus — **4 weeks**

- **A. Vector fields**
- **B. Line integrals and independence of path**
- **C. Green's Theorem**
- **D. Surface integrals**
- **E. Divergence and Stokes' Theorems**
- **F. Applications**

Methods:

1. **Lectures**
2. **In-class student activities (e.g., working problems, group activities)**
3. **Using graphing calculators and computers.**